NERAL LIBRARY
1919 Engineering Library

THE HEATING AND VENTILATING MAGAZINE

A MONTHLY JOURNAL OF ENGINEERING PROGRESS

Vol. XVI. No. 8
$2.00 a year. 20 cents a copy

AUGUST, 1919

Published at Cooperstown, N. Y.
New York Office, 1123 Broadway

GURNEY HEATERS
FOR HEATING ANY DESCRIPTION OF BUILDING BY STEAM OR HOT WATER
GURNEY HEATER MANUFACTURING CO.
NEW YORK OFFICE 11 E. 42ND ST. 188-200 FRANKLIN ST. BOSTON.

MASON REDUCING VALVES
and other PRESSURE REGULATORS
for all conditions of service
MASON REGULATOR CO., 15 Medway St Boston Mass.

DAVIS VALVE
STEAM SAVERS SINCE 1875
SPECIALTIES
PRESSURE REGULATORS, BACK PRESSURE VALVES, EXHAUST RELIEF VALVES, STOP AND CHECK VALVES, FLOAT VALVES, BALANCED VALVES, STEAM TRAPS AND OTHER VALVE SPECIALTIES FOR HEATING PLANTS
SEND FOR LATEST CATALOG
G. M. DAVIS REGULATOR CO.
436 MILWAUKEE AVE., CHICAGO

ATMOSPHERIC TEMPERATURES
Accurately Recorded
Continuous records of outdoor temperatures guide the operation of heating and ventilating systems. The sensitive bulb of a BRISTOL'S RECORDING THERMOMETER
Enclosed in a lattice box is installed out-of-doors and the recording instrument inside where it is readily referred to.
Write for Bulletin T-204
THE BRISTOL COMPANY Waterbury Conn.

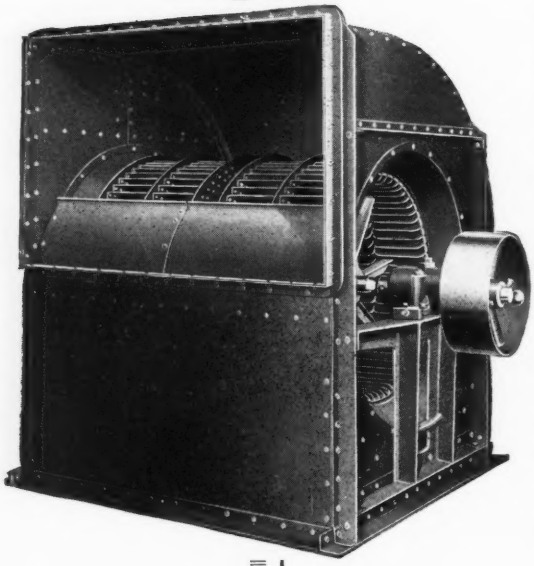
ROSS
FEED-WATER FILTERS
Will Keep Oil Out of Your Boiler
Regulating Valves for Water, Steam, Air
Ross Valve Mfg. Co. Troy, N. Y.
Ask for List of Users

Insures Satisfaction. A Valve for every System. Write for Catalogue and Discounts
208 NORTH FIFTH AVENUE CHICAGO.

Entered as second-class Matter at the Post-Office in Cooperstown, N. Y. Copyright 1919 by Heating and Ventilating Magazine Co.

CLARAGE
KALAMAZOO

A Well Made Fan With a Perfect Bearing



Choosing a well made fan, one which will give complete satisfaction through years of the hardest service, is important. Choosing a fan equipped with a bearing which will protect it at the one point where friction occurs, is vital. Without such protection, even the finest workmanship is not worth having.

CLARAGE MULTIBLADE FANS

are the one practical solution for both problems.

Clarage Special Bearings, an absolute protection against dust, grit, and therefore, wear, enables you to capitalize the high grade materials and workmanship incorporated in these Multiblade Fans.

Study the illustration. This bearing, with its special construction, and the felt washer protection it receives, is beyond the reach of the finest dust particles, no matter how hard and sharp. The same construction which keeps grit out, keeps oil in.

These are important facts described briefly. They merit further investigation. Write today for more information.

CLARAGE FAN CO.

HEATING, VENTILATING & DRYING ENGINEERS

KALAMAZOO, MICH.

THE HEATING AND VENTILATING MAGAZINE

AUGUST, 1919

A FAN HEATING SYSTEM INSTALLED WITHOUT THE USE OF GALVANIZED IRON

SUCCESS OF PLANT OFFERS SUGGESTION FOR TEMPORARY WORK WHERE TIME AND COST OF INSTALLATION ARE IMPORTANT ITEMS.

BY F. B. ROWLEY AND JOHN R. ALLEN.

The University of Minnesota was requested by the U. S. Government to provide barracks and mess halls for a prospective registration of 5000 men in the S. A. T. C.

One of the buildings selected for the purpose of housing and feeding the men was a three-floor structure of open-mill construction 300 x 300 ft., with stone and brick walls, occupied by the M. W. Savage Co., but originally built by the City of Minneapolis in 1881 as an exposition building. The building had been only partly heated and it was necessary to build and equip a complete heating plant in less than one month.

The floor plans of this building are shown in Figs. 3, 4, and 5, while the interior construction is shown by the photographs, Figs. 6, 7, 8 and 9. The ceilings are 20 ft. high on the first and second floors and 23 ft. on the third floor. The windows are large and loose fitting, the roof is of single thickness and contains a single-glass skylight 60 ft. x 100 ft., over the central portion of the building. Under the skylight is an open court through the second floor. There are no partitions on the third floor. The second floor is open, with the exception of the shower bath and the space below the open court. The partition around this open court is provided with six large double doors which are left open for air circulation.

FIG. 1—SOUTH FRONT OF EXPOSITION BUILDING.

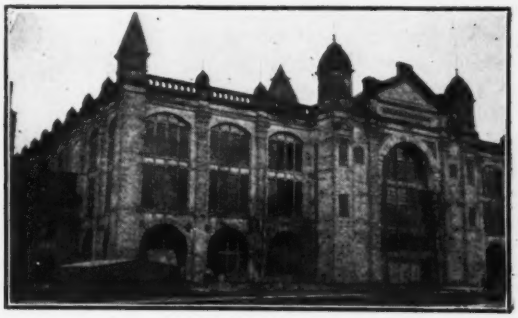


FIG. 2—NORTH FRONT OF EXPOSITION BUILDING.

ORIGINAL BUILDING ONLY PARTIALLY HEATED.

With the exception of a few old pipe coils on the second floor, there was no heat in the building. The high ceilings and open character of the building made it impractical to depend upon all direct radiation. On the other hand the large glass area, the poor roof construction with the corresponding large heat loss, made it inadvisable to install all indirect radiation. It was, therefore, decided to install a combination system.

The direct radiation, as shown on the plans, consists of a two-pipe, over-head main, vacuum system, with the return main run in a trench in the basement floor. A 12-in. steam main is carried from the boiler room to the ceiling of the third floor. This main is split into two 8-in. mains which traverse the building in opposite directions, reducing in size as shown. Two-inch risers are dropped from these mains by the side of each set of windows. The radiators being placed under the windows, two-column 28-in radiators were specified, but enough could not be obtained, therefore part three-column were used. Owing to the difficulty of getting supplies, it was not possible to hold fast to any one size or pipe or radiators.

INDIRECT HEATING SYSTEM RECIRCULATES MOST OF AIR.

With the exception of the air fur-

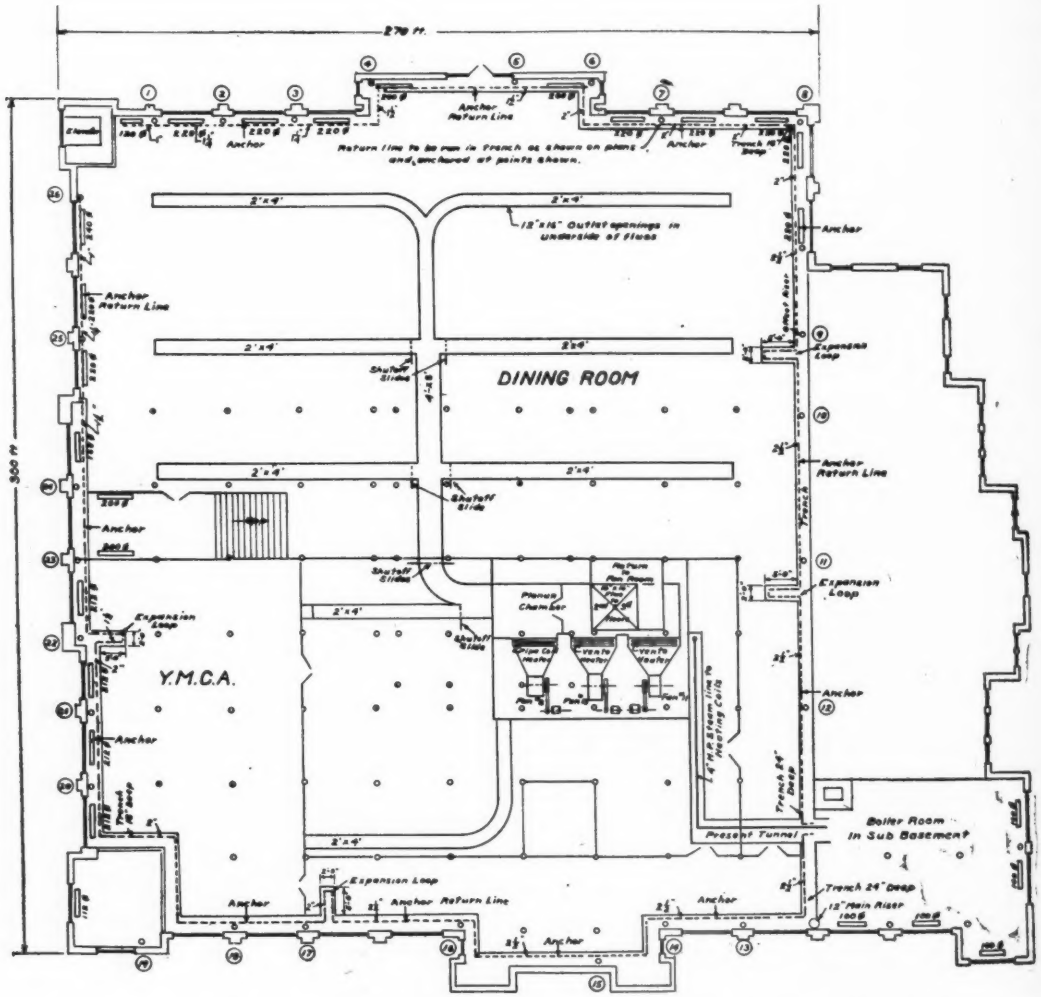


FIG. 3—FIRST FLOOR OF EXPOSITION BUILDING, SHOWING ARRANGEMENT OF HEATING AND VENTILATING EQUIPMENT.

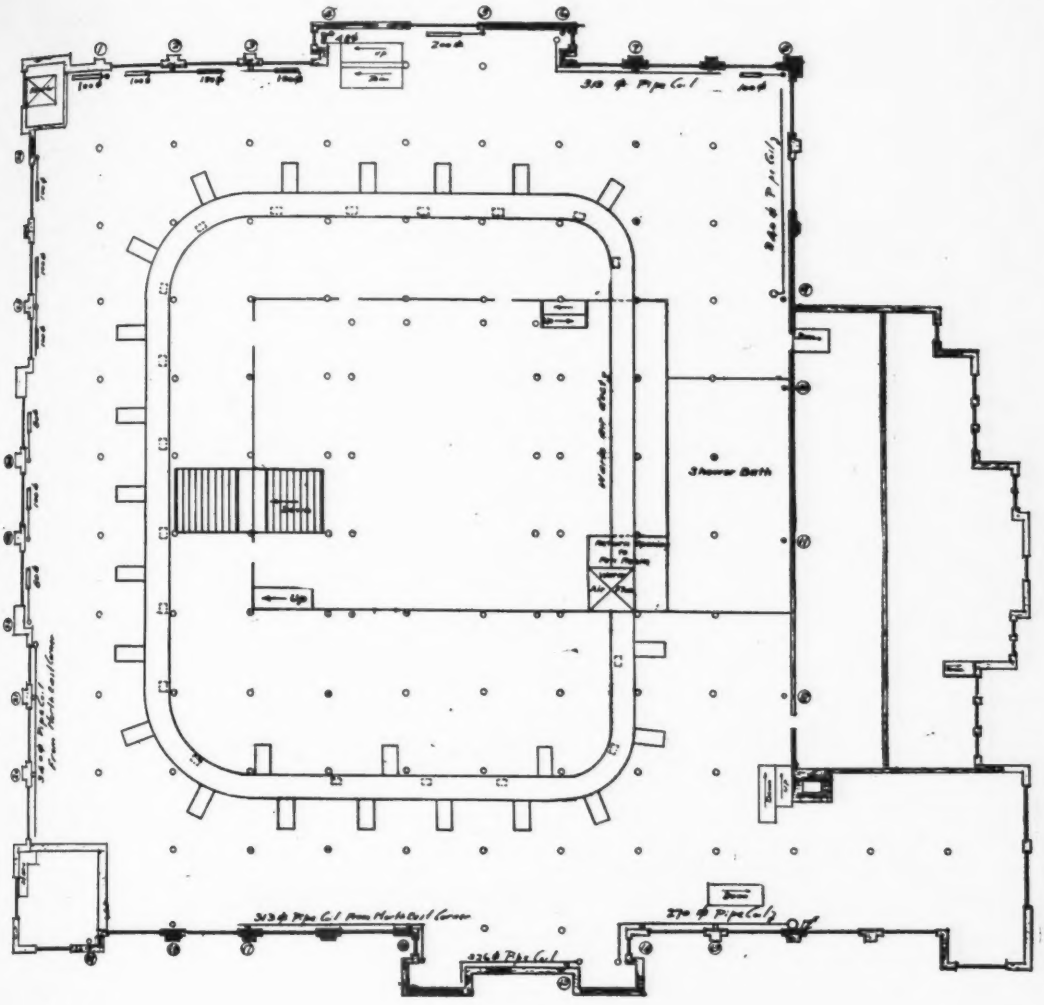


FIG. 4—SECOND FLOOR, EXPOSITION BUILDING.

nished to the dining room, all air of the indirect heating system was recirculated. As indicated on the first-floor plan, three fans were installed—a No. 11 single-inlet Sirocco, a No. 13 single-inlet Sirocco, and a No. 8 double-inlet Sirocco. Each fan was driven by a 15 H. P. A. C. motor and delivered 43,200, 50,250, and 38,939 cu. ft., respectively. The time for installation was so short that there was no attempt made to purchase, and such fans as were immediately available were made use of. Each fan delivered its air through two tiers of heaters to a common plenum chamber. From this plenum chamber a 16-ft. x 16-ft. flue led vertically through the second floor. Two 4-ft. x 8-ft. branches from this flue made a complete loop around the second floor. The flue was then reduced to a 10 x 10-ft. flue which passed through the third floor and split into two branches, making a loop of the third floor. These loops provided plenum chambers from which 18-in. x 36-in. lateral outlets were provided, with deflectors and shut off gates, and were slanted down to carry the air to the floor just in front of the windows.

The return air was brought back across the floor to the open court and down to the fan room through an opening provided in the first floor

around the 16-in. x 16-in. flue. Thus the return ducts consisted only of an opening through the first floor into the fan room. Besides the 16-ft. x 16-ft. flue leading from the basement plenum chamber, there was a 2-ft. x 4-ft. duct leading to the Y. M. C. A. and a 4-ft. x 8-ft. duct leading to the dining room both on the first floor. The air from the Y. M. C. A. was recirculated, while kitchen odors from getting into the dining room or from recirculating through the rest of the building. The main plenum chamber next to the fan room was divided by a partition with doors, in order that the air from fan No. 8 might be directed to the dining room and Y. M. C. A., irrespective of the operation of the rest of the plant. Shut-off dampers were provided for

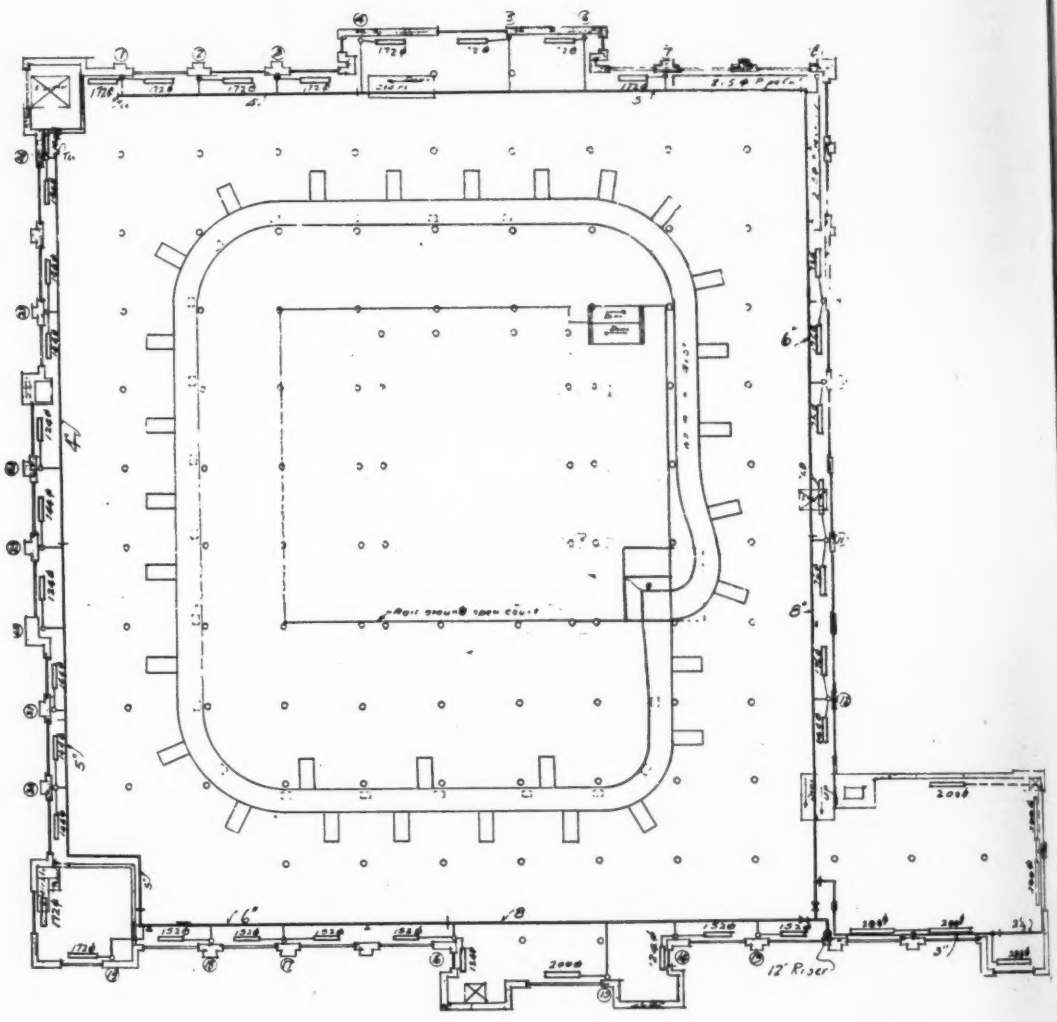


FIG. 5—THIRD FLOOR, EXPOSITION BUILDING.

that taken to the dining room was distributed through six 2-ft. x 4-ft. flues, with openings on the under side, and then discharged through ventilators in the roof over the kitchen. This provided a current of air from the dining room through the kitchen and out the roof ventilators, and prevented the the flues leading to the dining room, the Y. M. C. A. and to the branches on the second and third floors, as shown on the plans.

AIR DUCTS MADE OF WALL BOARD.

The limited time for installing the work, the large duct area, together with

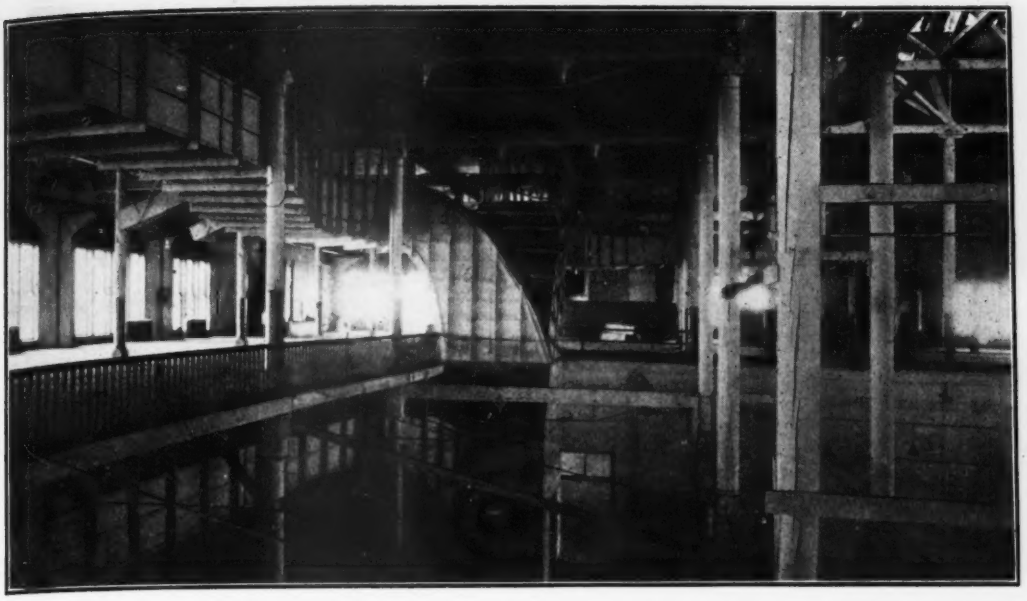


FIG. 6—MAIN AIR FLUE FROM PLENUM CHAMBER, WITH BRANCH CONNECTIONS, EXPOSITION BUILDING.

the high prices of galvanized iron and uncertainty of obtaining it, led to the selection of a cheap wall board for construction. This board was used for the fan room, the connections from the fan to the heater, the plenum chambers, and all ducts, about 62,000 sq. ft. in all. In the plenum chamber, the joints were covered with 3-in. battens, to take care of the expansion and contraction of the wall board. The ducts were framed with 2-in. by 6-in. and lined with the wall board. This construction was cheap, easy to install, and proved very satisfactory in operation.

With the recirculation system in

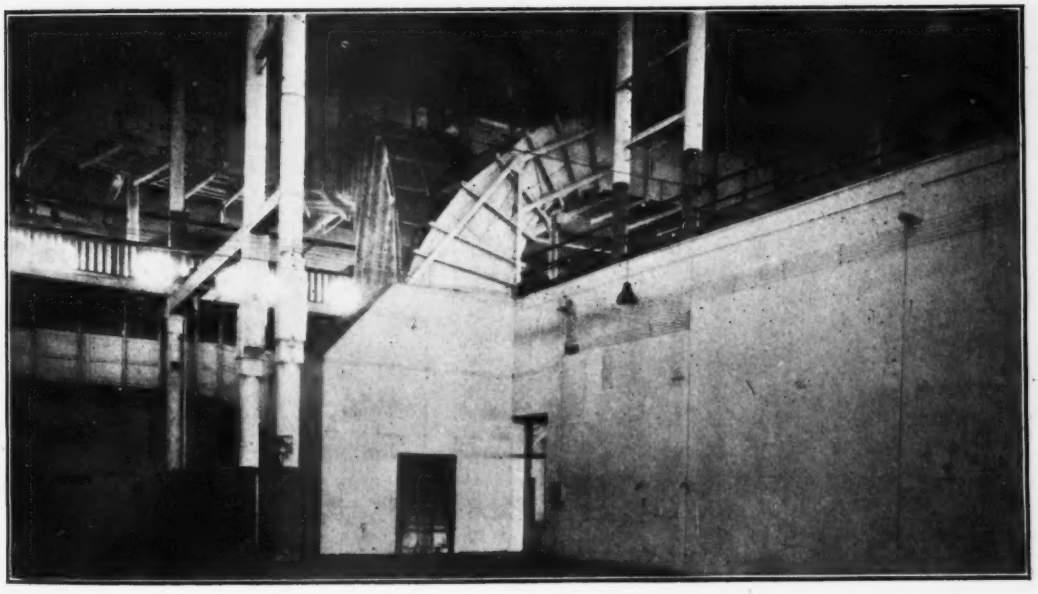


FIG. 7—MAIN FLUE 16 FT. x 16 FT. ON SECOND FOOR, LEADING FROM FAN ROOM, WITH BRANCHES FOR SECOND AND THIRD FLOORS.
Note return air opening through the floor.

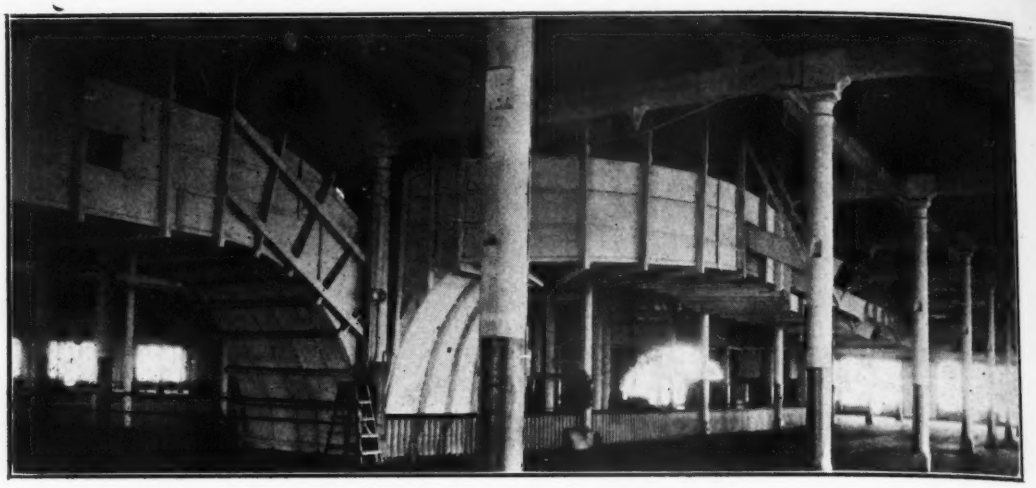


FIG. 8—MAIN DUCT CONNECTIONS TO RISERS ON THIRD FLOOR, ALSO AIR OUTLETS.

operation a very even temperature was maintained throughout the building. In some cases a temperature difference of 7° was noted between the third and second floors when the fans were not in operation. After the fans had been running for one-half hour, the temperatures were the same on both floors.

BOILER ROOM

The boiler room equipment consisted of two 150 H. P. Heine boilers and one 72-in x 20-ft. return tubular boiler. The Heine boilers have been in service for several years. The return tubular boiler was installed new. This plant supplied steam for the heating system for cooking and for hot water. The drain for cooking and hot water was especially heavy during certain periods of the day.

The returns from the heating system were delivered through two 6-in. x 7¼-in x 12-in. Marsh vacuum pumps to a receiving tank, from which the feed water was taken to the boiler.

Perhaps the most interesting feature about this plant is the construction of the indirect heating system. No galvanized iron was used on the job. So

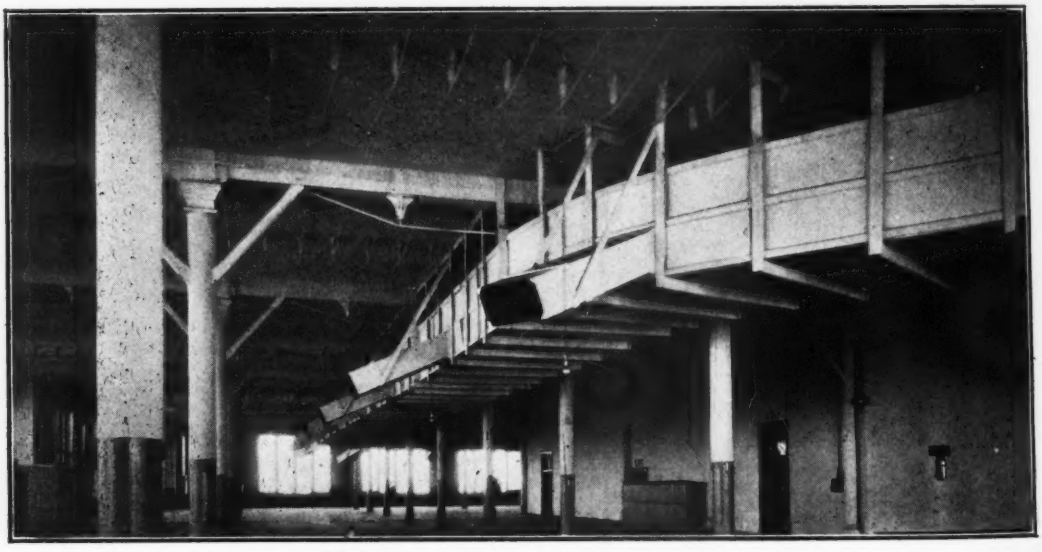


FIG. 9—MAIN DUCT AND OUTLETS ON SECOND FLOOR, LOOKING NORTH ALONG WEST SIDE OF BUILDING.

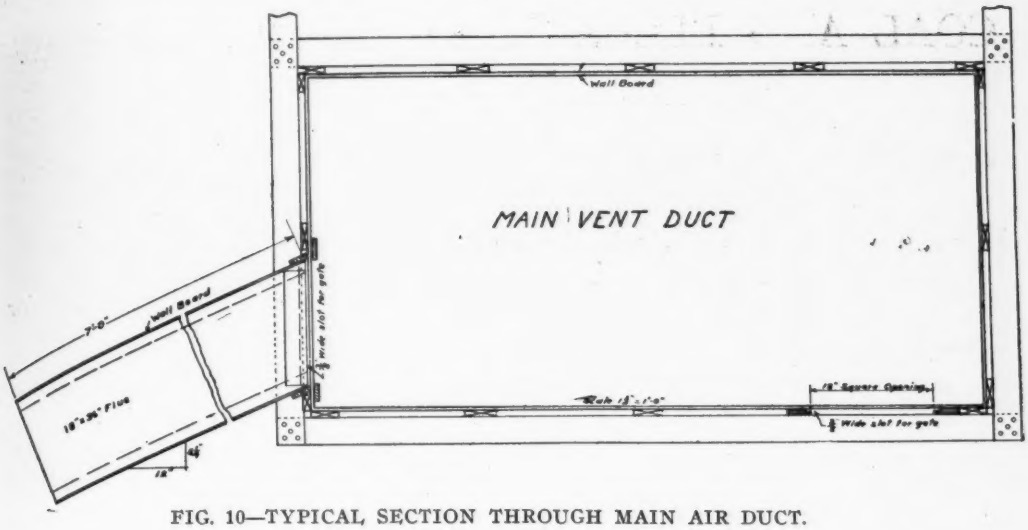


FIG. 10—TYPICAL SECTION THROUGH MAIN AIR DUCT.

far as the authors are aware, no similar system has been installed where wall board has been used entirely. The results obtained in this system were so satisfactory and the cost and time of installing the duct system so reduced, that it might be worthy of consideration in similar temporary jobs where the time and cost of installation are important items. The heating equipment was laid out and installed in a little less than three weeks.

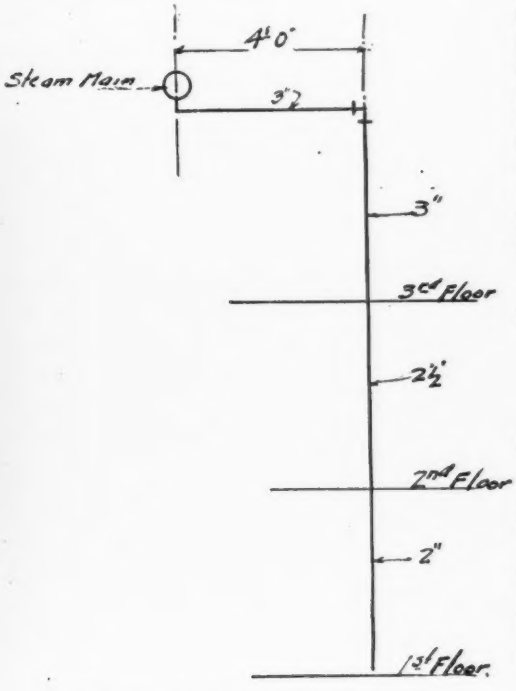


FIG. 11—TYPICAL STEAM RISER.

Europe's Shortage of Coal.

A special bulletin, issued by the Bureau of Mines, calls attention to "the alarming shortage of coal in Europe." This conclusion is based on the observations of George S. Rice, chief mining enginer of the Bureau of Mines, who has just returned from an extended mining investigation in France, Belgium, Great Britain, the Rhine Valley and the Saar districts. The only possibility of averting the shortage, he reports, is through an extensive exporting program on the part of the United States. It is estimated by the French engineers and from observations made by Mr. Rice that it will take from two to five years to restore the broken shaft linings which pass through the water-bearing strata, fissured chalks and marls overlying the coal measures and to unwater the mines and rebuild the surface plants, and that it will take ten years to completely restore the production rate of these mines.

Contrary to the general impression the coal mines of Belgium were not destroyed by the Germans.

Hand Grenade Banks for School Children.

Through the co-operation of the War Department, the Savings Division of the War Loan Organization is offering to the school children of America some 15,000,000 converted hand grenades for use as savings banks. Inquiries as to how to obtain the grenade banks should be addressed to any of the Government Savings Directors of the twelve Federal Reserve Districts.

COAL AND ELECTRICITY COMPARED FOR THE HEATING OF HOMES

Cost of Coal Would Have to Rise to $15.00 per Ton to Make Competition Possible, with Electricity at 35 Cents per Kilowatt Hour.

(From a report of the Hydro-Electric Power Commission of Ontario.)

During the past few years and, perhaps, more particularly since the fuel problem has become acute in Canada, an idea appears to have been gaining ground that the immense water powers of this great country (which by many people are vaguely considered as being illimitable) will amply suffice to meet all heating requirements; and that, in the Provinces of Ontario and Quebec especially, where water powers are so abundant, the fact that little or no coal is ever likely to be found is of no consequence.

Electric heating has so many advantages over other methods that probably "the wish is father to the thought" that it may some day replace coal, gas, etc.

Unfortunately, some engineers and a few other persons, who ought to know better, have been giving out hints that sooner or later electricity would come to the rescue and solve the heating problem completely, Unquestionably, in some of the more temperate regions of the world such comparatively small amount of heating as is required may be supplied through the medium of electricity, but the situation in Canada is altogether different.

The climate of the greater part of this country is so severe in the winter that even the immense potentialities of its water powers, if fully developed, would be altogether inadequate to cope with the demand for power for electric heating if this were fostered to any considerable extent.

An attempt is here made to eradicate, if possible, from the popular mind, this idea that electricity is destined to take the place of coal or other fuels for the heating of houses, offices, etc., on an extensive scale; and, at the same time, to indicate in what manner electric energy may be most usefully and economically applied for heating purposes.

ADVANTAGES OF ELECTRIC HEATING.

Undoubtedly electric heating approaches more nearly to the ideal than that obtained by any other means. Electric heaters can be designed for operating at any desired temperature, i. e., they may be arranged to work at a high temperature and give off radiant heat like a fire, or they may be designed for operation at a low temperature like a water or steam radiator, and give up their heat by convection. There is no dust, smoke, smell or noxious gas from an electric heater, no soot ashes, or dirt of any kind, and it does not vitiate the atmosphere by using up the oxygen; the heating can be under complete and ready control by the turning of a switch, thus decreasing or increasing the number of heating elements in service or shutting off the current entirely; automatic control by means of thermostats is of course possible. Electric heaters can be obtained in portable form and there is less risk of fire from electric heating than from any other method.

DIFFICULTIES PREVENTING THE ADOPTION OF ELECTRIC HEATING ON A LARGE SCALE.

No other system of heating can claim all these advantages. What, then, are the difficulties in the way of utilizing electric energy for this purpose on a large scale?

The difficulties are two, viz:

(*a*) The enormous amount of energy that would be required and which could be more efficiently applied to other purposes.

(*b*) The high cost of electric energy for heating as compared with other sources of heat energy.

ASSUMED CASE OF HEATING A HOUSE BY COAL, AND THE HORSE-POWER EQUIVALENT OF THE COAL USED.

Let it be assumed that an 8-room house uses 9 tons of anthracite per season of 7 months at a cost of $10.00 per ton.

Assuming that a fire is burning during the whole of this period, the coal is burnt in $7 \times 30 \times 24 = 5{,}040$ or say 5,000 hours, which is at the rate of $\frac{9 \times 2000}{5000} = 3.6$ lbs. per hour or 0.06 lb. per minute.

Since 1 lb. of coal will yield 12,500 B. T. U., 0.06 lb. burnt per minute will yield 750 B. T. U. and $750 \times 778 = 583.500$ ft. lbs. per minute; and since 33,000 ft. lbs. per minute equal one horse-power, coal is here burning continuously at an average rate equivalent to $\frac{583{,}500}{33{,}000} = 17.5$ h. p.

Note that this 17.5 h. p. is the *average* rate for the season; naturally on the coldest days coal will be burnt at a much higher rate than the average.

Assume, therefore, that the maximum rate is 50% greater than the average rate(it is probably appreciably more than this): then coal will be burnt at a maximum rate equivalent to 26 h. p.

In burning coal or any fuel there is a certain unavoidable loss of heat, up the chimney, and in other ways, and tests have shown that in an ordinary house, even with the best attention, the average loss is not less than 35% of the total heat energy in the coal and it may be 50 or 60% if the fire be carelessly handled. Let us say that 40% is lost, then the "efficiency" of the furnace would be stated at 60%, i. e., of each 100 heat units put in, in the form of coal, 60 are made use of in actually heating the house. Hence it may be said that the *useful* average power rate is not 17.5 h. p. but $17.5 \times \frac{60}{100} = 10.5$ h. p. and the *useful* maximum rate is not 26 h. p. but $26 \times \frac{60}{100} = 16$ h. p. approximately.

On converting electricity into heat there is no loss such as takes place with coal, and the efficiency is said therefore to be practically 100%. It follows then that if a house be heated by electricity we shall only require to meet the net maximum demand of 16 h. p., as there is no lost power to be supplied. This sounds encouraging, but disappointment is in store.

HORSE-POWER REQUIRED TO HEAT THE HOMES OF TORONTO.

For example, there are about 80,000 homes in the City of Toronto; if each of these is to be heated and a demand of, say, only 12 h. p. per home must be met (probably a very conservative figure as an average for large and small homes) no less than 960,000 h. p. must be supplied for homes alone—no factories, no offices, no works, no street cars, no houses even, will get any lighting or power from this, it is all required on the coldest days for heating homes alone, and more will be needed in proportion, as the population increases. The great Chippewa scheme at Niagara Falls only contemplates developing 300,000 h. p. for the present and the total generated at Niagara 780,000 h. p. and the entire maximum demand of all Toronto at present, including all power, lighting and traction purposes is only in the neighborhood of 125,000 h. p.

It may be added that the 6,000,000 h. p. which represents the estimated total possible development of Ontario water powers is not sufficient to supply merely the existing *homes* of Ontario with electric energy for heating alone, exclusive of all other domestic, commercial and industrial requirements.

ENERGY FOR HEATING REQUIRED ONLY IN THE WINTER.

A still further difficulty in supplying electric energy for heating on an extensive scale lies in the fact that all the heating is required in the winter only and assuming that maximum

demand of 1,000,000 h. p. had to be met for supplying a city like Toronto, the load on the plant required for this purpose, throughout the summer months, would be practically nothing. In other words, for five months every year this enormous plant would be idle. Suggestions have been made that use might be made of it to supply certain industries which could be operated mainly during the summer months, but here there are two difficulties: (1) What are the industries on a large enough scale to be of any use? (2) How could such enormous undertakings afford to lie idle during the winter months when power was unavailable? The situation in this case would be just about as bad for the industries in the winter as for the electric stations, without the industries, in the summer.

Figures and statements such as the foregoing, which are based on incontrovertible facts, should once and for all answer the question in the negative as to whether the great water powers of Canada will ever entirely solve the fuel problem in a climate such as that of Ontario and Quebec.

COST OF HEATING A HOUSE ELECTRICALLY AT LOWEST DOMESTIC LIGHTING RATES.

Turning to our second difficulty, it was found above that power at an average rate of 10.5 h. p. would be required throughout the entire season—this means that the horse-power hours (h. p. hrs.) needed are $10.5 \times 7 \times 30 \times 24 = 52{,}920$ (h. p. hrs.).

Electricity is sold by the kilowatt-hour (kw. hr.) and a kilowatt equals 1.34 h. p.; therefore, if the price per kilowatt hour be, say, 1 cent, the price per h. p. hr. would be practically 0.75 cent, so that the season's bill on this basis, if electricity were used, would be $52{,}920 \times 0.75 = \$397.00$; the net amount would be 10% less, viz.: $357.00. People would not care to pay so large a bill for heating an 8-room house for a single season if they could do it for $9 \times \$10 = \$90$ by means of anthracite, even if they had the satisfaction of eliminating dust, dirt, ashes, labor, etc. The price per kilowatt hour (1 cent) assumed above is the lowest domestic rate of the Hydro-Electric Power Commission of Ontario at present available in Toronto; were it reduced to ½ cent, heating by coal would still be very much cheaper.

It has been assumed in the foregoing that the service charge for the house at the standard Hydro-Electric Power Commission's rate of 3 cents per 100 sq. ft. of floor area has been already paid for by the person living in it for his lighting service and is not therefore charged against his heating account; but undoubtedly it would cost more to supply him with a maximum demand of 15 h. p. instead of, say, 1 to 5 h. p. for lighting, cooking, etc., and therefore an increased service charge would be essential; this, however, has not been reckoned in. This is very evident when it is considered that, to supply such an extra load for a larger community, much larger meters, heavier overhead wires, stronger construction, bigger substations, more powerful generating stations and increased size of equipment in every way would be required.

COST OF ELECTRIC HEATING IF CURRENT BE SUPPLIED AT "POWER" RATES.

With a demand of such magnitude in houses as is indicated above, it is possible that supply authorities might be prepared to give service on a power schedule; hence the cost on this basis will be of interest also.

Taking for the sake of illustration, the cheapest power rate of the Hydro-Electric Power Commission of Ontario, viz.: that of Niagara Falls, Ontario, the heating of a house, such as was assumed above, with a maximum demand of 12 h. p. (= 9 kw.) and an average demand over the period of 715 hr. per month (= 5,000 hr. per season) of 10.5 h. p. (= 8 kw.) would work out as follows:

Service Rate.—$1.00 per month per h. p. of maximum demand.

Consumption Rates.—2.2 cent per k. w. hr. for the first 50 hrs. monthly use of load; 1.5 cent per kw. hr. for the next 50 hrs. monthly use; 0.15

cent per kw. hr. for all remaining consumption.

The gross bill subject to discounts of 50% and 10%.

The service charge will of necessity be spread over the entire 12 months; hence, per season, it will amount, for 12 h. p. maximum demand, to $\$1.00 \times 12 \times 12 = \$144.40$ gross. The average monthly consumption will be $8 \text{ kw.} \times 715 \text{ hrs.} = 5{,}720 \text{ kw. hrs.}$

The charge of electric current will be:

450 kw. hrs. at 2.2 cents.....	$9.90
450 kw. hrs. at 1.5 cents.....	6.75
4,820 kw. hrs. at 0.15 cents.....	7.23
Gross bill for current for one month	$ 23.88
Gross bill for current for 7 months	167.16
Gross service charge (see above)	144.00
Total gross bill for season....	311.16
Less discount of 50% and 10% (55%)	171.14
Total net bill for season.....	$140.02

It will be seen that, while, reckoned on this basis and at the lowest existing power rates, the bill is considerable less than calculated above on the ordinary lighting rate, yet the cost of heating by electricity is, even so, more than one and one-half times that of heating with anthracite; the over-all net cost per kilowatt hour in this case equals 0.35 cents as compared with the net lighting rate (used above) of 0.9 cents per kw. hr.

COST OF DEVELOPING A MILLION HORSE POWER.

The capital cost of furnishing 1,000,000 h. p. to the City of Toronto, including hydro-electric development at Niagara Falls and all the switching and transforming equipment together with transmission and distribution lines, etc., etc., would probably be somewhere between $200 and $250 per h. p. to deliver electricity to the consumers' houses—this means a capital investment of from 200 to 250 million dollars. This enormous sum, owing to the fact that the plant would be idle for nearly six months out of every twelve, as already pointed out, would, during half of its existence, be earning nothing, and the services of a large number of men would, of necessity, have to be retained throughout the summer months during the non-earning period in order that they might be available when required in the winter.

Thus the capital charges and running costs of such a plant, compared with its earning capacity would be very heavy. Annual charges on such a plant, covering interest, sinking fund, depreciation, maintenance and operation, would amount to from $22.00 to $27.00 per h. p. year. This plant would only be used for heating during a period of six or seven months, and the consumers would have to pay the charges for the whole year during this period.

Further, there would be no "diversity" factor enabling the supply authority to make any reduction on this cost, as is possible with ordinary, existing electricity supply, since the power would be required practically continuously throughout the cold season.

ELECTRIC HEATING AUXILIARY TO OTHER SYSTEMS OR IN MILD WEATHER.

The use of electric heaters, however, as auxiliaries to other systems to warm up an otherwise cold room or during chilly periods in the spring and autumn when the furnace is hardly needed will prove in very many cases a great convenience; and, provided that the period of use be short, e. g., for an hour or two in the morning or evening, it will be almost as economical to use electric energy in this manner as to light a fire in the furnace, and very much less trouble.

POSSIBILITIES OF REDUCING COST BY ELECTRIC HEATING.

Again, at present rates for electric current, it is likely that considerable reductions may be made in the cost of electric heating by the judicious use of electric fans to thoroughly circulate the air from the heater and bring all

parts of the room to approximately the same temperature; the extra cost of current required for a fan is very small compared with the advantage to be gained.

In one case, it is reported that satisfactory results were obtained by placing a fan, pointed slightly downwards, behind the electric radiator and blowing the warm air across the floor of the room, the effect of this is to make the warm air first circulate around the feet of the occupants of the room and it is said to give a general sense of comfort which is entirely absent when the feet are cold although the upper part of the body may be warm. This scheme, is of course, applicable to steam, water or hot air heating.

Regarding the future outlook for the use of electric energy for heating it may be said that to push the matter on an extended scale would be economically unsound in Canada where such enormous amounts of energy would be required for this purpose alone, as all other fields of application for electric energy would suffer seriously thereby.

At existing rates for coal and other fuels, compared with those for electricity, electric heating is too expensive to be adopted extensively, but as an auxiliary its advantages are so attractive that efforts will undoubtedly be made to reduce the cost so as to make its use in this way more popular.

As electric heaters work at 100% efficiency no gain can be looked for so far as they are concerned but by improving the methods of applying the heat, by storing electric energy, in the form of heat, during off-peak hours (e. g., by heating a large reservoir of water) thereby making use of electricity during part of the day when it is sold at a low rate, some reduction of cost seems to be feasible.

CENTRAL STATION HEATING IN DETROIT

BY J. H. WALKER.

(From a paper presented at the Spring Meeting of the American Society of Mechanical Engineers, in Detroit, June 16-19, 1919.)

Started in a limited way about 40 years ago, the central heating industry has grown steadily, though not with the rapidity of some other utilities, until at the present time there are between 200 and 300 enterprises operating as public utilities in cities of all sizes in most of the northern States and doing an annual gross business estimated at from $10,000,000 to $15,000,000. The capital invested is perhaps $30,000,000 to $40,000,000. Further development of the business now hinges mainly upon the possibility of the establishment of the proper relationship between rates and the cost of service so as to insure adequate return upon invested capital. In many instances this relationship is not satisfactory at present, chiefly because the actual cost and the value of the service are not known. The engineering practicability has been amply demonstrated; and that there is a pronounced economic demand for the service is beyond question.

The central heating business is closely allied with the electricity supply business and in most cities is carried on directly or indirectly by the electricity supply companies. The task of supplying the demand for heating service falls quite naturally to the electric company because of the partial similarity in the methods of production and distribution of the two commodities; and because the ability to offer to its prospective customers both electric and heating service, with the consequent entire elimination of any sort of power plant from the customer's building, is of great advantage to an electric company doing business in a large city.

Other reasons for the combining of the two utilities are the economies in the consumption of fuel, and to some extent in the investment costs, which are sometimes made possible by the physical combination of the electric and heating plants.

The heat carried away by the condensing water in the central electric stations of the United States, equivalent to about 60% of the total fuel burned by them, is one of the more obvious, although not by any means the greatest, wastes of the country's resources. Like many other similar losses this one exists, not because its reduction is theoretically impossible, but because it is seldom commercially practicable. But although commercial considerations have always dictated certain practices in the utilization of fuel and will continue to do so in the future, the increasing cost of coal and the present impulse toward its conservation now direct attention to some of the fundamental problems involved.

(Mr. Walker then went on to show how this great quantity of heat, rejected at low temperature from the generating units, cannot as a rule be used entirely for the heating of buildings on account of the great diversity in the rate of use of the two commodities, electricity and steam heat.)

The lack of agreement in their use from week to week throughout the year is illustrated in Fig. 1, in which the 1918 load curves for electrical and heating service in Detroit are plotted to a percentage scale, with the maximum point on each curve taken as 100%.

The demand for electricity for industrial use, which now constitutes a major fraction of the output of most central stations, is the only kind of load whose characteristics could conceivably be adjusted to suit the requirements for exhaust heat and even this could probably not be done to any practicable extent.

(Another reason cited by Mr. Walker is the great development of the central electric stations which in many industrial centers have so increased in size that the amount of exhaust heat which would be available as a by-product is greatly in excess of that which it would be commercially feasible to distribute for the heating of buildings.)

THREE METHODS OF CENTRAL STATION HEATING.

Assuming that a central heating load exists and is to be supplied by the electric company, there are in general three methods by which this can be done:

1. The heating load can be served from a condensing generating station so designed that steam is available for heating at pressures above atmosphere after partial expansion in the electric-generating units, the remainder of the steam used for current gen-

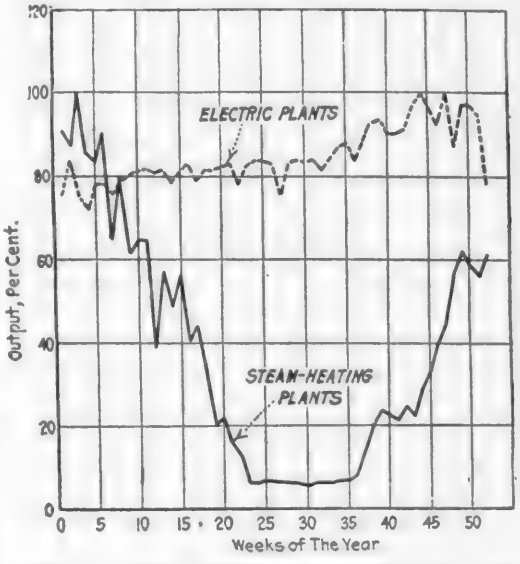


FIG. 1—LOAD CURVES OF ELECTRIC AND STEAM HEATING PLANTS.

eration being fully expanded and condensed at high vacuum.

2. Separate heating plants may be built in locations near the heating load and equipped with non-condensing generating units which will generate current only to the extent of the requirements for exhaust steam for heating, the remainder of the electricity being produced in a condensing station.

3. The heating system may be supplied entirely with live steam from boiler plants located near the center of the heating load.

It may so happen that the natural location for the main generating sta-

tion serving a city is near the heating load, and if this is the case, the first method is preferable. Often, however, a consideration of land values or of railroad connections requires that the main condensing station be located at such a distance from the heating load as to preclude the possibility of transmitting steam from it. This is the case in Detroit. The Delray plant and the Connors Creek plant, the two main generating stations operated by The Detroit Edison Company, are respectively 3½ and 4½ miles from the heating district. A condensing plant, located on high-priced land near the heating district and with inconvenient railroad connections, or none, would be necessary if this first method were to be used. To such a plant, built for electricity supply and consequently, for reasons previously stated, burning more coal than a plant built solely for heating, this matter of proper railroad facilities is particularly important. Here again enters the matter of the transmission of steam, for the size of the pipes required to transmit a given quantity of steam over a given distance decreases as the density of the steam and the amount of pressure drop along the pipe increase. The most economical method from the standpoint of investment costs would be to extract steam from the high-pressure stages of the turbine, but the amount of electricity which could be generated per pound of steam would then be reduced.

In Detroit many of these conditions conspire to make the use of exhaust steam for heating unattractive. Generating units exhausting into the heating mains were operated in one of the heating plants for several years, but this practice has since been definitely abandoned and the heating system is now being supplied with live steam. Current generation is limited to the output of small house-service, turbo-generators whose exhaust is utilized to heat the feed water. The history of the central heating industry in Detroit is one of steady progess toward this method of live steam operation.

DEVELOPMENT OF DETROIT SYSTEM.

The immediate motive which, in 1903, led to the establishment of the central heating industry in Detroit, was the possibility of obtaining a high thermal efficiency in the generation of electricity through the utilization of the exhaust steam. The generating plant from which steam was first supplied for heating had previously discharged its exhaust to the atmosphere. Owing to the building, at this time, by The Detroit Edison Company, of a large condensing plant, the smaller plant, with several others, would have been shut down, but the possibility of selling the exhaust steam made it appear desirable to continue the generation of current there to the extent of the exhaust-steam requirements. Also, since the plant was located in a district served with direct current the loss involved in converting an equivalent amount of alternating current received from the main plant to direct current would be saved for such current as might be generated there. The plant was in a high-class residence district and the heating service proved very popular, but the actual overall economy of the plant was not as great as had been anticipated.

A year later the construction of a central heating plant was begun in the business district of the city. This second project was undertaken, not as a means of disposing of exhaust steam, but for the express purpose of supplying the demand for central heating service among the owners of downtown buildings who were considering shutting down their plants and purchasing electric service. The downtown plant was built primarily as a heating plant and though provision was made for electric generating units they were never installed and the heating mains were supplied with steam from the boilers through reducing valves.

With the development of the large condensing generating stations the generation of current in the heating plants grew less and less attractive and when a third heating plant became necessary because of increasing demand for steam heat no provision was

made for electric generators. The same practice was followed when, in 1916, the original exhaust-steam plant was rebuilt; and when the steam distribution system of another company which had been engaged in the generation of electricity and the distribution of exhaust steam in the business district was purchased by The Detroit Edison Company the new plant which was built to supply this district was also designed as a heating plant only. The entire combined distribution system is now being supplied with live steam from the boilers through reducing valves.

Since there are no generating units exhausting into the heating system the pressure carried on it is not limited by considerations of back pressure. On those sections of the system formerly supplied with exhaust steam at from 2 to 5 lbs. pressure, the pressure now maintained ranges from 5 to 15 lbs. and is being increased from year to year, toward the upper limit permitted by the strength of the pipes. The pressure on the section originally designed as a live-steam system is about 30 lbs. Because of the increased capacity of the distribution system at higher pressures, due to the greater density of the steam and the greater allowable pressure drop, these higher distribution pressures are desirable.

The steam is delivered to the network of mains through connections made at the plants and also through feeders, from the plants which deliver steam to certain feeding points in the distribution network, the method being similar to the feeder and main method employed in electric distribution systems.

(The author here presented an analysis of the conditions which made it commercially justifiable to supply live steam to the heating system and to abandon the generation of current in the heating plants, even though such current would be generated at a high thermal efficiency.)

The method of live-steam operation was adopted in Detroit before the recent great advance in the price of coal. The present high price of coal makes exhaust-steam operation appear somewhat more favorable and it is, of course, conceivable, that at some future date a very high coal price may compel a change of policy. But with the cost of underground lines also increasing, the saving in distribution investment will probably continue to be sufficient to justify a continuation of the present methods.

Most of the foregoing facts only apply in cases where the generating capacity in the heating plant is negligible in comparison with the main generating stations. If this is not the case, if the discrepancy in size is not great so that investment in the main plants is actually saved, or if the additional current required from the condensing station is actually not produced at a relatively low cost, then the situation may be entirely changed, and there are many instances of this in the United States. The consideration of the steam-transmission investment when low-pressure steam is used is usually controlling, however, and is being increasingly well recognized.

(Mr. Walker described in detail the equipment and arrangement of the central heating system in Detroit, supplementing his paper on the subject presented at the January, 1917 meeting of the American Society of Heating and Ventilating Engineers and presented in THE HEATING AND VENTILATING MAGAZINE for April, 1917.)

THE TRANSMISSION OF STEAM IN A DISTRICT HEATING SYSTEM BY MEANS OF HIGH-VELOCITY FEEDERS

BY NORMAN W. CALVERT.

(From a paper presented at annual convention of National District Heating Association, Pittsburgh, June, 10-13, 1919.)

The method of operation of The Detroit Edison Company's district heating system is a unique departure from general practice. This departure was necessitated by the rapid growth of the business district and the popularity of the heating service, which two factors combined to bring on the system a load which the mains were entirely inadequate to handle. In seeking a solution of this difficulty, other than replacing the mains already laid, with larger ones, an idea was hit upon, closely paralleling the mains and feeders method of a large electrical distribution system, where feeders carry the current from the generating station directly to the heavily loaded districts and there tie into the distribution mains. On the heating system, high velocity feeders were designed to transmit steam with a large pressure drop, from the plants to different points in the distribution network of mains.

In laying out the steam feeders, a careful study was made of pressure drop in various sized pipes, so as to install these lines of such a size as to keep the investment costs and radiation loss at a minimum. Since the size of the pipe govern the investment costs, it is advisable to install as small a pipe as possible and allow a large pressure drop. Inasmuch as live steam only is fed to the heating system, this pressure drop is limited only by the pressure which can be carried on the boilers. Advantage is taken of the large differential between boiler pressure and distribution pressure to reduce the size of the pipe by allowing the pressure drop to take place largely along the pipe itself. In fact, under maximum conditions, the entire drop could be allowed to take place in the pipe, instead of in the reducing valve. This greatly increases the capacity of the feeder and allows the use of relatively small pipe. The steam is delivered from the boiler header to each feeder through a pressure-reducing valve and the pressure at the valve is varied so as to maintain the required pressure at the distribution end of the feeder. Fig. 1 illustrates graphically the pressure drop in such a feeder. For a light load, the pressure drop takes place largely in the reducing valve; while for a heavy load the greater portion of the total drop occurs in the pipe itself.

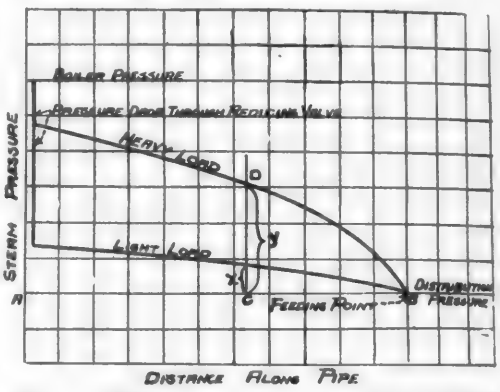


FIG. 1—PRESSURE DROP IN LIVE STEAM FEEDERS UNDER HEAVY AND LIGHT LOADS.

In designing these feeders, the question of velocity was practically disregarded. By actual test on one feeder, it was found that under conditions of heavy load, the velocity attained was 75,000 ft. per minute. Owing to the large quantities of steam flowing, the radiation loss per pound of steam is practically negligible and the total heat per pound of steam remains nearly constant during expansion, the steam reaching the feeding point in a superheated condition. To reconvert some of the velocity head of the steam into static head, and thereby reduce the total pressure drop and increase the capacity of the feeder, the velocity of the flow is reduced at the end of the feeder by a gradual enlargement of the

pipe. A typical connection of this sort is shown in Fig. 2.

At present The Detroit Edison Company has in service seven such high velocity feeders, consisting of three 12-in, two 10-in. and two 8-in. pipes. Fig. 3 is a map of the heating system, showing the location of these feeders.

In operation, the engineer at the plant is furnished with a record of the pressure existing at the distribution end of the feeder by means of an electrically-operated long-distance gauge. On the charts furnished for these gauges, the allowable limits of pressure are marked in black ink, and the engineer is instructed to carry the pressure within these lines.

When these long-distance gauges, of which there are now ten in operation on the system, were first installed, they were placed in tunnels and manholes, and considerable trouble with the mechanism was encountered, due to the action of heat and moisture on the electrical parts of the transmitter. To obviate this trouble, a patrol box was designed to be set up on the street curb near a manhole. In this box are installed the long-distance gauge-transmitter, an indicating gauge and a telephone jack, to permit the use of a portable telephone in checking the pressure

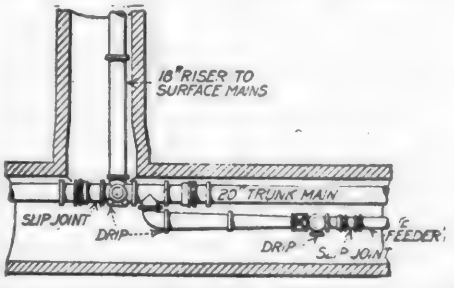


FIG. 2—CONNECTION FOR REDUCING FLOW VELOCITY AT END OF FEEDER.

shown on the gauges. The steam line and electric cable are brought underground from the manhole to the patrol box.

Although the patrol box is heavily insulated with cork, trouble was experienced in zero weather with the freezing sylphons on the gauges. To eliminate this trouble, some method of heating the box was first sought, but no satisfactory method of regulating the temperature inside the box was found. The heat loss from the cork-lined box was so small, that with very little heat being supplied, the temperature soon reached that of the manholes and the same trouble of overheating presented itself. Various mechanical devices for temperature regulation were considered but could not be used on account of the limited space inside the box. The problem was finally solved by designing a sylphon to operate with oil instead of water, and one of these devices is now installed in each patrol box. The oil used in these sylphons has a freezing point considerably below zero, and there is no heat required in the boxes at any time. Under present conditions, the majority of these gauges require little time or no attention, other than a periodical checking to see that they are recording correcly.

INTERMEDIATE CONNECTIONS MADE WITHOUT USING SEPARATE FEEDERS.

It has been found unnecessary to install a separate high-velocity feeder to each point in the distribution network, where additional steam supply is required. Experiments were made, with a view to taking intermediate connections from the existing feeders, between the plant and the distribution point. By referring to Fig. 1, the length of the feeder is represented by the line AB, and we will assume that at some intermediate point, as C, it is required that a connection be made, serving the district in that immediate vicinity. Under conditions of light load, the drop in pressure through this connection would be represented by the distance x; while with a heavy load, the drop would be represented by the distance y. The relation of the pressure drop in the connection, to the amount of steam passing through it, will have a definite characteristic and the problem has been to design a throttling device having such a characteristic that it will maintain proper pressure on the distribution mains a point C; at the same time feeding enough steam to supply the demand in the district served. At the present time, the experiments along this line have not progressed far enough to show definitely whether the required result can be obtained by the use of a throt-

tling device, such as a globe valve, or whether a pipe resistance will also be necessary.

There is one factor very favorable to this arrangement of intermediate connections, in that the feeding points are all interconnected through the distribution mains. Referring to the chart again, it is seen that if the pressure should rise too high at C, since C and B are connected by the distribution mains, the pressure on the system will tend to equalize itself. By locating a long-distance gauge at each feeding point on a feeder, and allowing a fairly wide enough range of pressure on each

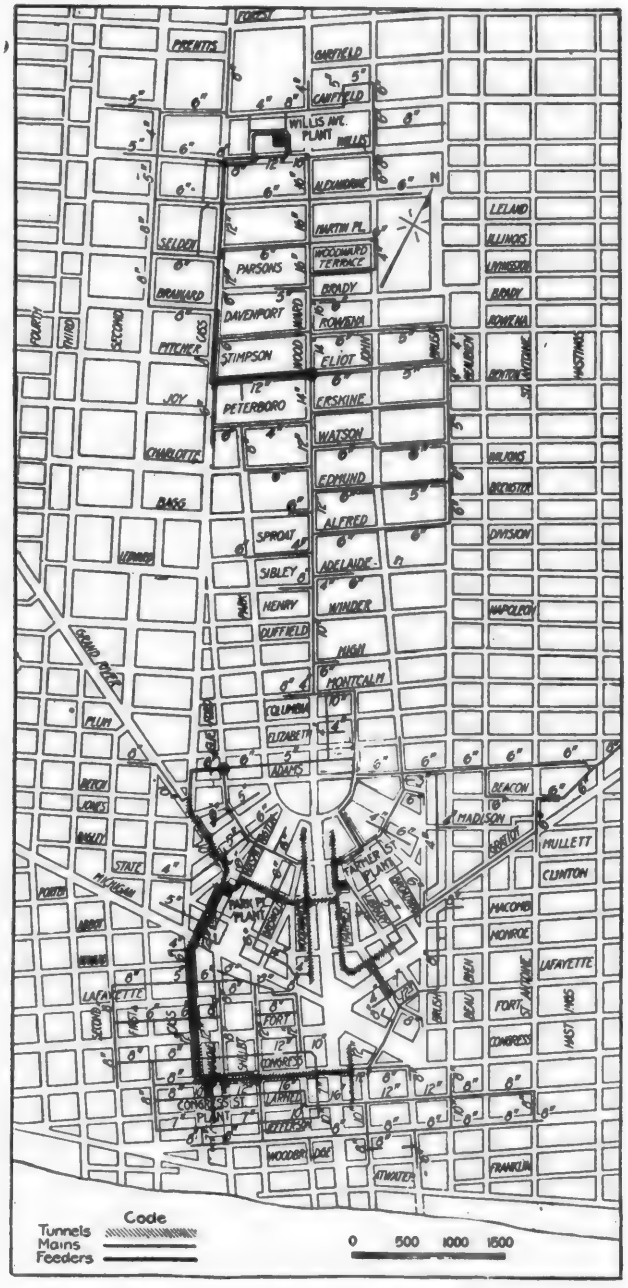


FIG. 3—DISTRIBUTION MAINS, SHOWING FEEDERS, DETROIT CENTRAL STATION HEATING SYSTEM.

one, it has been found entirely feasible to carry all the pressures within the required limits.

The ideal system of distribution would be one in which the mains would be so laid out that the pressure drop from the plant across the entire system would be such that the minimum allowable pressure would be reached at the end of the lines. In cases where, for any reason, such as an irregular growth of connected load, the system can not be so designed, the same results can be closely approximated by the use of high velocity feeders. On the Detroit Edison Company's downtown lines, a pressure of from 28 to 35 lbs. is maintained at the feeding points, while the customer is guaranteed a minimum pressure of 10 lbs. This allows a pressure drop of from 18 to 25 lbs. across the system, and under conditions of heavy load this drop actually occurs.

Obviously, such live-steam feeders could be advantageously applied to exhaust steam systems on which the limit of back pressure has been reached. Where this condition exists, the available exhaust is usually inadequate in extreme weather, and such live steam as is added should be fed into the system at some distant point through a high-velocity feeder, instead of being fed in at the plant and thereby further raising the back pressure on the engines. Another case in which such feeders can be used occurs when local conditions require that the boiler plant be located at some distance from the center of the load.

In addition to furnishing a means of supplying steam to the low-pressure points remote from the plants, the feeder method results in a great saving of time and labor and a marked increase in efficiency of operation in comparison with the old method of feeding the system through reducing valves, located at different points on the system, connecting the high and low-pressure mains. Some idea of the advantage acquired may be gained from the fact that as against eleven reducing stations in operation on the distribution system three years ago, there are now never more than two, and these two are used more as a matter of precaution than from absolute necessity. The method, being new, is constantly undergoing minor changes, but the general idea of high-velocity feeders is proving highly satisfactory.

Contents and Arrangement of Proposed Central Station Heating Handbook.

What is considered by many to be the most important action taken at the recent convention of the National District Heating Association was the decision to publish an association handbook on central station heating data. It is proposed to have the handbook made up of loose-leaf sheets, 4 x 7 in., and filed according to the decimal system. With such a system all that is necessary is to arrange the sheets in simple numerical order. The following shows the principle used in this method of classification:

1. GENERAL.
2. GENERATION.
3. DISTRIBUTION.
4. UTILIZATION.

1. GENERAL.

1.1	Expense
.11	Investment
.111	Lands
.112	Buildings
.113	Plants
.114	Mains
.115	Services
.116	Miscellaneous
.12	Operation
.121	Wages
.122	Fuel
.123	Water
.124	Lubricants
.125	Miscellaneous supplies
.126	Insurance
.127	Taxes
.128	Rent
.13	Interest and depreciation data
.14	Loans and credits
1.2	Income
.21	Rates
.22	Steam revenue
.221	Heating
.222	Power
.223	Cooking
.224	Refrigeration
.224	Hot water
.226	Miscellaneos
1.23	Water
1.24	Other income
.241	Interest
.242	Dividends
.243	Rents
1.3	Management
.31	Policy
.311	Public
.312	Employees
.312,1	Welfare work
.32	Legal questions
.321	Legislation
.322	Franchises
.323	Claims
.324	Personal injury
.325	Property injury
1.33	Insurance
.331	Fire
.332	Liability, etc.

2. GENERATION

2.1	Buildings and fixtures
.2	Fuel and ash handling apparatus
.3	Stokers

.4 Furnaces and brickwork
.5 Boilers
.6 Chimneys and breechings
.7 Pumps and piping
.8 Heaters and purifiers
.9 Instruments, gauges and miscellaneous apparatus

3. DISTRIBUTION

3.1 Mains (System)
.11 Steam
.12 Return
.13 Hot water
.14 Underground construction
.141 Tunnels
.142 Buried
.143 Manholes
3.2 Pipe
.21 Sizes
.22 Carrying capacities
.23 Joints
.24 Fittings
.241 Ells, tees, etc.
.242 Expansion joints
.242,1 Slip
.242,2 Variators
.242,3 Corrugated copper
.242,4 Packing sleeves
.242,5 Bends
.25 Supports
.26 Insulation
.27 Casing and tunnels
3.3 Services
.31 Casings
.32 Valves, location
.33 Reducing valves
3.4 Meters
.41 Testing
.42 Types
.43 Types
.421 Condensation
.422 Water (cold)
.423 Steam flow

4. UTILIZATION

4.1 Requirements
.11 Heat losses, maximum demands, etc.
.12 Consumption by special apparatus
4.2 Types of Systems
.21 Steam
.211 Gravity
.212 Vacuum
.213 Vapor
.22 Hot water
.3 Equipment
.31 Radiators
.311 Direct
.312 Indirect
.313 Economizers
4.32 Water heaters

A School Ventilating System That is Different.

A blast system of heating and ventilation in which the warmed air is admitted to the rooms through openings in the ceiling and the exhaust air taken out through registers near the floor line is the subject of an interesting article published in *Sirocco Service* for April, the periodical of the American Blower Co., Detroit, Mich. The installation is described by Dr. E. Vernon Hill, chief of the Division of Ventilation, Chicago Health Department.

Dr. Hill calls this system "the old upward system of ventilation turned upside down." He adds that its success as deter-

FIG. 1—CLASSROOM IN LINCOLN SCHOOL WHERE TEST WAS MADE.

FIG. 2—ONE OF THE FOUR AIR OUTLETS FROM THE ROOM.

mined from tests merits attention to its features on the part of the engineering profession. It has received the unqualified endorsement of the teachers in the schools.

The particular system in question is installed in the Lincoln School, Rockford, Ill. It is an old building that was remodeled some three or four years ago at which time the Beery system was installed. In the so-called Beery system, the direct radiation is placed at the ceiling line, in that way removing a disturbing factor in the convection currents at the breathing zone and permitting a better air distribution throughout the room. Further, the location of the coils at the ceiling line and the distribution around the four sides of the room, it is pointed out, make it possible to obtain much more uniform temperatures than where the direct radiation is split up into small units at the floor line. The fact that the air is introduced at the ceiling, it is also claimed removes the warm air in the neighborhood of the radiation and prevents the wide difference in temperature between the ceiling and the floor line that is observed in ordinary installations. The entire air travel, being downward with very slight lateral motion, prevents drafts on the occupants.

The feature in this equipment, that is spoken of as more important than any other, is that the amount of heating surface in the room and its distribution takes care of all heat losses, prevents cold walls and windows and allows of the introduction of air for ventilating purposes at a comparatively low temperature, about 70°. This latter item is considered very important and the success of the method is attributed largely to this factor.

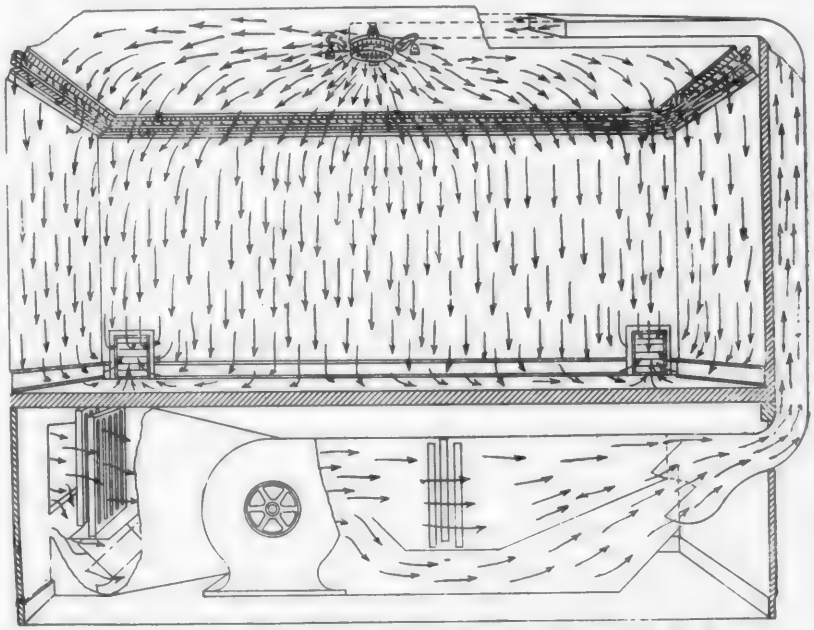


FIG. 3—COURSE OF HEATED AIR FROM HEATER AND FAN THROUGH ROOM.

This particular system consists of a Sirocco fan and Sirocco air washer, with a well-designed system of ducts and distributors, as in the ordinary plenum ventilating equipment.

TEST DATA

STREET No. 401 N. COURT ST. DATE MARCH 6, 1919

BLDG LINCOLN SCHOOL ROOM 3 FLOOR 1 TIME 2.30 PM to 3.30 PM.

STATION	TEMPERATURE DRY BULB	TEMPERATURE WET BULB	R H %	AIR MOTION	DUST	BACTERIA	ODORS	CO_2	SUPPLY REGISTERS AREA ϕ	SUPPLY REGISTERS VELOCITY	SUPPLY REGISTERS C F M	EXHAUST REGISTERS AREA ϕ	EXHAUST REGISTERS VELOCITY	EXHAUST REGISTERS C. M
A 1	68	53	35	3		3	96	8.1	1.4	600	840	1.25	170	212
B 2	68	53	35	3	3560	1	96	7.2	1.4	520	728	1.25	140	175
C 3	69	53	33	3		1	96	6.1				1.25	130	163
D 4	69.5	53.5	34	3	2670	1	96					1.25	140	175
5	68.5	53	34	3	3115	2	96	7.1			1568			725
6														
7														
8														
9														
10														

PRIMARY SENSE IMPRESSION GOOD NOTES ROOM 25'X30' - 12' CEILING

5" DIA EXHAUST DUCT FROM WARDROBE.

				RADIATORS TYPE	RADIATORS SQ FT	WEATHER
No OCCUPANTS	34	WINDOWS No				TEMP DRY 26° WET 21° R H % 40
PHYSICAL STATE	L. W.	TYPE	DBS.			WIND DIR S VEL 6 MI PER HR
AIR SPACE PER OCCUPANT	265	AREA	108	CEILING	95	CHICAGO COMMISSION ON VENTILATION
TOTAL AIR SUPPLY BY CO_2 PER MIN	1100	LEAKAGE	SLIGHT	FLOOR		TEST BY E.V.H & O.W.A
AIR SUPPLY PER OCCUPANT BY CO_2 " "	32.3	RATIO TO CU CONTENT	1:83			PLOTTED BY ARMSTRONG
" " " " " FAN " "	46	FLOOR AREA PER PERSON	22			APPROVED BY Curtis
AIR DISTRIBUTION %	90.1					CHAN. No.

FIG. 4—TEST DATA, LINCOLN SCHOOL CLASSROOM, MARCH 6, 1919.

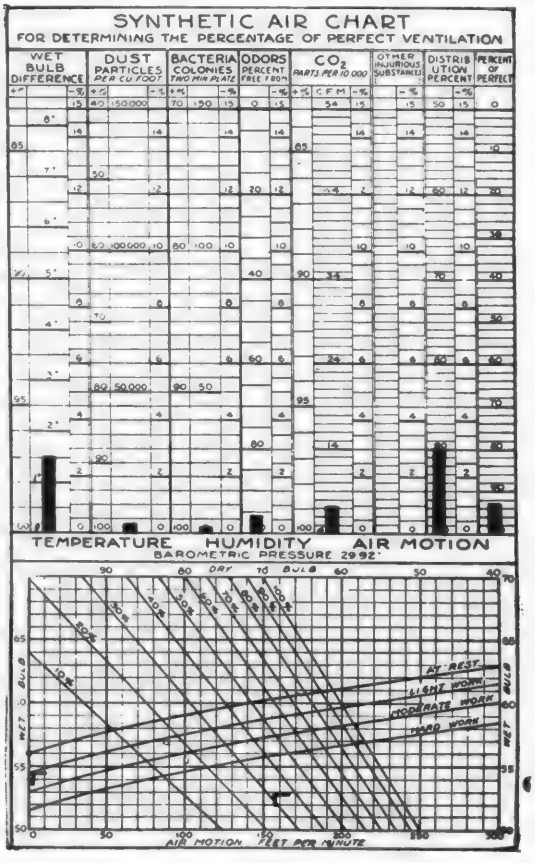


FIG. 5.—PERCENTAGE OF PERFECT VENTILATION, LINCOLN SCHOOL CLASSROOM, ACCORDING TO TEST DATA.

A sufficient amount of direct radiation is provided to amply care for the heat losses from each room. This consists of two complete rows of 1¼ in. pipe suspended on the walls at the ceiling line. These pipe coils are partly covered by an ornamental scroll open at the top and bottom to allow free circulation of air about the coils.

The air is introduced into the rooms through specially designed diffusers suspended from the ceiling. (Fig. 1.)

They consist of octagonal boxes so designed that the air is distributed laterally in every direction, downward through the slatted base.

In the standard 40 pupil class room two of these diffusers are used, each receiving its air supply from the plenum chamber direct. Outlets from the room are provided, four in number, one in each corner at the floor line. The latter lead directly to the attic space where the vent is provided with a right angle elbow over which a piece of canvas is suspended. This canvas flap serves to prevent back draft and also to offer a slight resistance to the exhaust air, allowing of a slightly higher pressure in the class room than with a free opening.

The test of the air conditions in the room was made on March 6, in the afternoon, while the pupils were in their seats and the ordinary activities of the class room were in progress. Tests were made to determine the various factors required

for the synthetic air chart, which is shown in Fig. 5. The test data are shown on the other side of this card (Fig. 4). The final percentage of perfect, as shown by the test was 92.5%, which is very much better than usually obtained in the ordinary class room.

On examining the chart it is readily seen that this percentage could be further improved by reducing the wet bulb difference shown in column No. 1 and by improving somewhat the distribution shown in the last column. The first factor could easily be corrected by the more careful adjustment of the humidostat. This would increase the percentage something over two points, making the final 94.5%. The distribution is a variable factor, depending upon the opening of doors into the corridors, the direction of the wind, temperature, etc.

Installation of Unit Heaters in Ford Eagle Works.

A striking instance of the adoption of the unit blast heater for warming industrial plants is shown in the case of the Ford Eagle Works, Detroit, Mich., where no less than 60 Ilgair unit heaters, made by the Ilg Electric Ventilating Co., Chicago, Ill., are installed for heating the entire building.

The building in question is of steel construction, with an unusual amount of glass exposure. It is approximately 1800 ft. long, 350 ft. wide and 55 ft. high. All of the 60 unit heaters installed are of 36-in. size, of the floor type, with the adjustable deflectors so set that the circulation takes place entirely at the floor level. The heating of the upper layers of the air is, therefore, entirely disregarded.

The total horse-power in the motors is 60 and the heating of the entire building was successfully accomplished during the winters of 1918 and 1919.

TYPICAL UNIT HEATER IN PLANT OF FORD EAGLE WORKS.

GENERAL VIEW OF FORD EAGLE WORKS, SHOWING LOCATION AND PIPING CONNECTIONS TO ILGAIR UNIT HEATERS.

THE HEATING AND VENTILATING MAGAZINE

A Monthly Journal of Engineering Progress
Member of the Associated Business Papers Inc.
Member Audit Bureau of Circulations.

Vol. 16 **August, 1919** **No. 8**

Published Monthly at Cooperstown, N. Y. by the
Heating and Ventilating Magazine Co.
Executive and Editorial Offices, 1123 Broadway New York

A. S. ARMAGNAC ..... *President*
GUSTAVE PETERSEN .... *Secretary and Treasurer*

A. S. ARMAGNAC, Editor
GUSTAVE PETERSEN, Business Manager

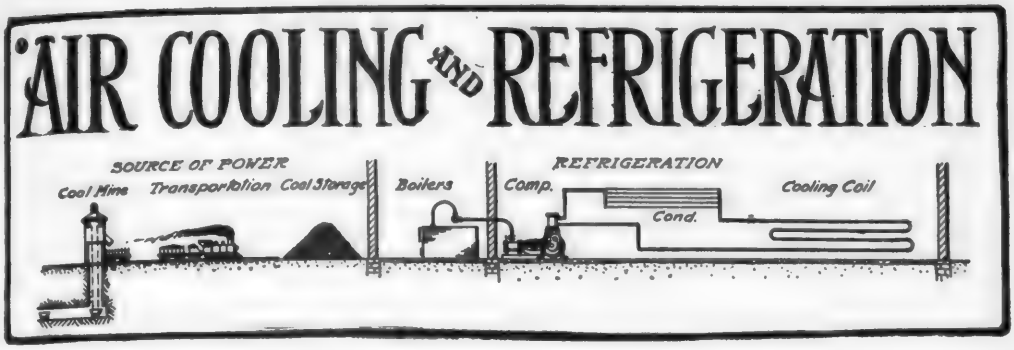
European Representative
W. G. HOLLINGWORTH, 304 High Holborn: London, W. C.

Subscription	$2.00 per year
Canada	2.25 " "
Foreign Countries	2.50 " "
Back numbers	25 cents each

NOW THAT the season of trade conventions, salesmen's meetings and business outings is fairly over it is time to give practical consideration to the problems immediately before us and to determine as far as possible the trend of events. First of all must be recorded the pronounced activity in the building construction line, in spite of high costs and high wages. The trade is busy and its activities are not confined to isolated sections but extend to all parts of the country. It has been hard for many to realize, much more to swallow, the new scale of costs, but we have it on the authority of hard-headed business men, like those composing the Merchants' Association of New York, that high costs and high wages have come to stay. In other words, we are on a new level. It will not mean so much if the increase is made to apply to both sides of the ledger. This is something the laboring man is just beginning to find out. But there are some classes of workers which have not struck this balance yet. Estimators and draftsmen are still being sought on the old scale of salaries. Always an underpaid profession, these men are to-day among the most conspicuous victims of the course of events. The employer who expects this state of affairs to continue is about due for a rude awakening and should make plans accordingly by adding the proper percentage to his "overhead," and passing it along to the men who do so vital a part of his work. Such a thing as "draftsmen's union" would have met with ridicule in the old days, but these are not the old days and more than one student of the times has put forward the idea that if Labor is to keep on the way it is going every class of workers will have its union, from the chief executives down.

As for the practice of heating and ventilation, surprisingly little that is new or different has emerged from the war. Outside of the progress made by the unit blast heaters, it would be hard to find anything new or fundamentally different in the heating line. For a while the Canadians turned wistfully to the possibilities of electricity for heating, to be generated by the Dominion's vast water power. But the limitations, and even the impossibility, of such a proposition is set forth very clearly in an official report which is reproduced, in part, in this issue. In England vast housing schemes involving whole communities are under way, the plans for which include systems of central station heating.

In the United States it is now well established that we are launched on a long business boom. While special work will continue to be the order in the air conditioning line, the bulk of the business in the heating line will be straight work in steam, water and fan blast installations, with the vapor heating systems maintaining all of the popularity gained in recent years.



THE PSYCHROMETRIC CHART EXPLAINED

A new attempt to explain, in as simple a manner as possible, the principles involved in the development of psychrometric charts and tables is made by L. A. Wilson, writing in the Sibley Journal of Engineering. Mr. Sibley, who is research associate at the Engineering Experiment Station, University of Illinois, starts out by saying that undoubtedly there are a great many engineers dealing with humidity problems who do not understand the principles involved.

An important point to remember is that the usual humidity tables, as well as the psychrometric charts, are generally worked out for standard atmospheric pressure of 14.7 lbs. per square inch, so that they are useless by themselves for any other pressure. For this reason occasion might readily arise wherein accuracy would demand recourse to data not furnished by the usual humidity tables. In practical work, the barometric pressure is seldom, if ever, exactly 14.7 lbs. per square inch.

In systems of forced ventilation, with air washers or humidifying apparatus in conjunction with fan, problems like those suggested naturally arise.

The common "wet and dry bulb" method of determining relative humidity is applicable in almost any case, but one cannot always make use of the common humidity tables unless he is dealing with atmospheric pressures. It may be necessary, then, to work out a chart or a set of tables for the particular pressure involved before the relative humidity can become known from the wet and dry bulb readings.

HOW TO CONSTRUCT A PSYCHROMETRIC CHART.

With this introduction, Mr. Wilson proceeds to explain how a psychrometric chart may be constructed for any given pressure. He develops such a chart for 20 lbs. per square inch, absolute pressure, basing his calculations upon 1 lb. of air.

It is well known that a pound of dry and saturated steam (water vapor) at a given temperature occupies a definite and unvarying volume and exerts a definite and unvarying pressure. This law holds true for steam alone or for steam mixed with air or any other gas. If the temperature is known, the pressure and the specific volume of the steam may be ascertained from steam tables.

Dalton's Law states that in a mixture of gases, or in a mixture of vapor and gas, each constituent of the mixture occupies the whole volume and exerts a "partial pressure" such that the sum of the partial pressures of the constituents equals the pressure of the mixture. Considering henceforth a mixture of air and steam (water vapor), let us designate the partial pressures by p_a and p_s respectively, and let the pressure of the mixture be P. Expressing Dalton's Law algebraically, we have the simple equation

$$P = p_a + p_s \quad \ldots\ldots\ldots\ldots\ldots\ldots (1)$$

When dealing with any gas, such as air, the laws of a perfect gas are applicable. Combining Boyle's Law and Charles' Law, and substituting the proper numerical constant, we obtain the following equation for 1 lb. of air:

$$144\, p_a\, V = 53.54\, T \quad \ldots\ldots\ldots\ldots\ldots\ldots (2)$$

when p_a is the absolute pressure of the air in pounds per square inch, V is the volume occupied in cubic feet, and T is the absolute temperature in Farenheit units.

In a mixture containing 1 lb. of air and M_s pounds of dry and saturated steam, the volume of the mixture is entirely occupied by both constituents. It is assumed that the temperature and the pressure of the mixture are known by observation. The volume, v", of 1 lb. of dry and saturated steam at that temperature may be found from the steam tables. The volume occupied by the unknown quantity M_s may then be expressed by the equation:

$$V = M_s v'' \quad \ldots\ldots\ldots\ldots\ldots\ldots (3)$$

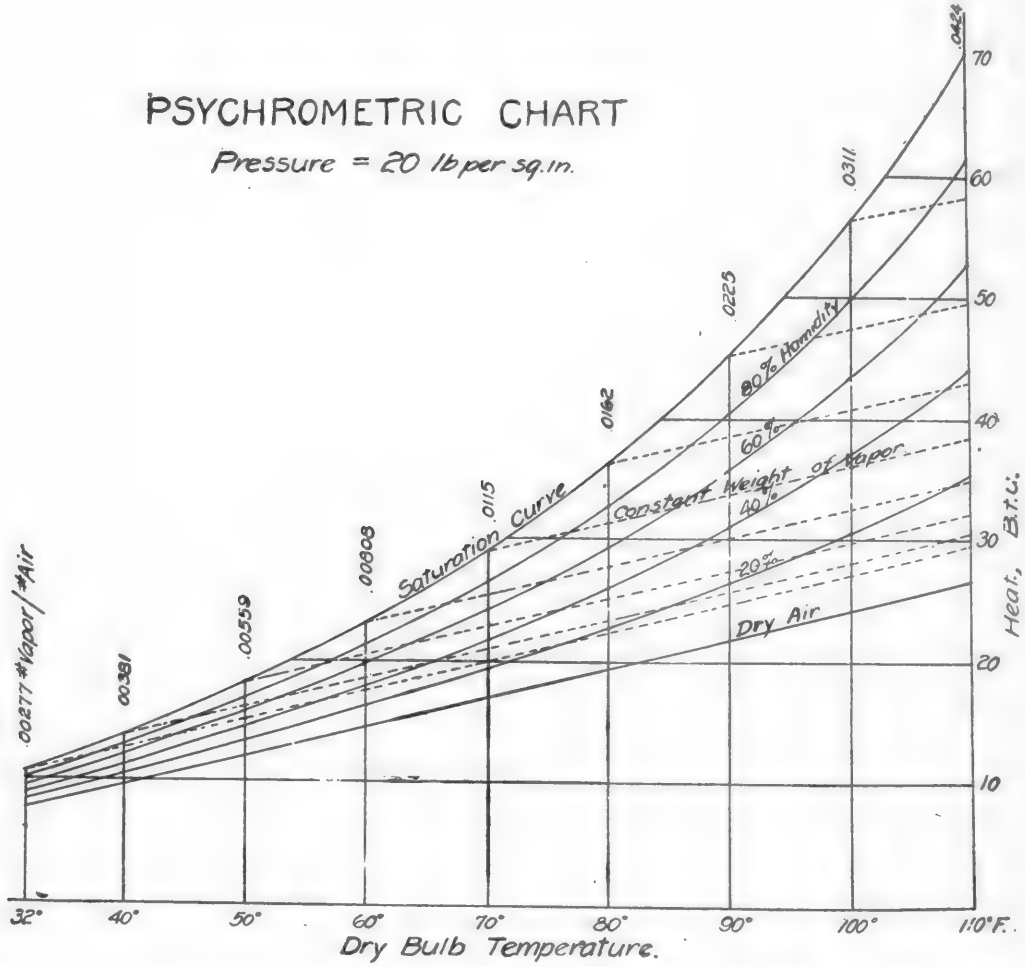
Since V is also the volume of the air in the mixture, equal to the volume of the mixture as a whole, we may combine equations (1), (2) and (3), and get the expression:

$$M_s = \frac{0.3704\ T}{(P - p_s)v''} \quad \ldots\ldots\ldots\ldots\ldots\ldots (4)$$

Equation (4) enables one to determine the maximum amount of vater vapor that can exist admixed with air for any given pressure and temperature of the mixture. This is the "saturated" condition. If less than the maximum amount is present, the water vapor or steam is superheated, and equation (4) does not apply. The ratio of the weight of vapor present in any case, divided by the maximum weight that could exist under the given conditions, is known as the "relative humidity."

PRINCIPLE OF DETERMINING RELATIVE HUMIDITY.

Briefly, the principle of determining relative humidity by means of wet and dry-bulb thermometers is as follows. The actual temperature of the mixture is determined by means of a bare thermometer. At the same time another thermometer with its bulb covered with wet gauze is exposed to the same current of air. Evaporation of moisture from the gauze absorbs heat and produces a "cooling effect" on the bulb of the thermometer, thus causing it to register a lower temperature. This is on the same principle that the human body becomes "chilly" when emerging from a bath. The drop in temperature is proportional to the rapidity of evaporation, and the rapidity of evaporation is proportional to the relative humidity of the air. Neglecting radiation loss, the temperature shown by the wet bulb is the saturation



PSYCHROMETRIC CHART BASED ON AN AIR PRESSURE OF 20 LBS. PER SQUARE INCH.

temperature at the observed pressure of the mixture.

The psychrometric chart is constructed with dry bulb temperatures as abscissae and heat in B. T. U. as ordinates. The heat of 1 lb. of air, measured from any arbitary starting point t_o, is given by the general expression:

$$h_a = C_p (t - t_o) \quad \ldots\ldots (5)$$

in which C_p is the mean specific heat of air at constant pressure, and t is the observed temperature. For the sake of convenience, t_o may be chosen as o° F., and for ordinary temperatures and pressures C_p is approximately constant and equal to 0.242. Simplifying equation (5) by these numerical substitutions, we get

$$h_a = 0.242\ t \quad \ldots\ldots (6)$$

In psychrometric work in which the wet-bulb thermometer is used, we are concerned only with the so-called "latent heat of evaporation," which is usually designated by the symbol r in steam tables. In a saturated mixture, in which the weight of water vapor per pound of air is M_s, the latent heat furnished by the vapor is

$$h_s = M_s\ r \quad \ldots\ldots (7)$$

Combining equations (6) and (7), the heat of the mixture is

$$H = h_a + h_s = 0.240\ t + M_s\ r \quad \ldots (8)$$

Assuming various values of t from 32° F. upward, equation (4) may be solved to determine corresponding values of M_s. Then equation (8) may be solved and the results plotted to produce the so-called "saturation curve." The values of M_s at the various temperatures may be noted on the saturation curve for convenient reference.

Bear in mind that the condition of saturation involves the maximum amount of water vapor that can exist under the given set of conditions. The relative humidity becomes equal to 1.00, or 100%, at saturation. For any other then the saturated condition, the relative humidity is indicated by the expression:

$$\text{R. H.} = \frac{M_s}{m_s} \quad \ldots\ldots (9)$$

in which m_s designates the weight of water vapor actually present in 1 lb. of air under the existing conditions. If the relative humidity is only 50%, say, then only half of the maximum amount of water vapor possible is present, and a wet-bulb thermometer would show a corresponding heat exchange. Neglecting the inappreciable radiation loss, such a transfer of heat is sensibly adiabatic, i. e., without loss, and the heat represented at the lower temperature of saturation indicated by the wet-bulb thermometer should be the same as the heat of the unsaturated mixture at the observed dry-bulb temperature.

Plotting the results of equation (6) for various assumed temperatures, we get a straight-line curve that represents the heat per pound of dry air. Since the "latent heat" added by the water vapor is proportional to the amount of water vapor present, up to the point of saturation, and since this in turn is proportional to the relative humidity, the portion of each ordirate between the "dry air" curve and the "saturation" curve may be divided into ten equal parts (or more or less than ten if desired), each representing an increment of 10% humidity, and curves drawn through these points are humidity lines.

The "dew point" is the temperature below which a mixture of water vapor and air would have to be cooled down at constant pressure before condensation of the vapor would take place. In other words, it is the saturation temperature for a given weight of vapor lines. These lines run practically parallel to the curve for dry air, and are shown dotted in the illustration. Take, for example, the case of 0.0115 lbs. of water vapor per pound of air. It will be noted from the diagram that this quantity of vapor is just sufficient to saturate 1 lb. of air at 70° F. If this mixture is heated to 100° F., with the same weight of vapor present, the air is no longer saturated because it requires 0.0311 lbs. of vapor for saturation at that temperature. The relative humidity at 100° F. is, in that case, $0.0115 \div 0.0311 = 37\%$. Reversing this process by tracking back on the chart along a constant-weight-of-vapor-line to the saturation point enables one to determine the dew-point temperature for a mixture of given relative humidity.

APPLICATION OF CHART.

To illustrate the application of the chart for determining relative humidity from wet and dry-bulb readings, suppose we take, for example, a dry-bulb temperature of 100° F. and wet-bulb reading of 80° F. The wet-bulb temperature represents the condition of saturation, it being assumed that the air adjacent to the wet bulb is in a state of saturation because of evaporation from the gauze surrounding the bulb. In saturated air, there would be no evaporation from a wet-bulb thermometer and it would read exactly the same as the dry-bulb thermometer. In other words, the reading of a wet-bulb thermometer in unsaturated air is exactly what a dry-bulb thermometer would read if the same mixture was at the saturation point. Re-

ferring to the chart, and reading up to the saturation curve from a dry-bulb temperature of 80° F., it will be noted that the heat per pound of air saturated at that temperature is approximately 36 B. T. U. Since the exchange of heat from the wet bulb is adiabatic, we may trace a horizontal (constant heat) line from that point to the ordinate for 100° F., and find about 38% for the relative humidity at that temperature. There is exactly the same amount of heat to be considered, whether the mixture is at 100° F. with a relative humidity of 38%, or saturated at 80° F.

WRINKLES

How to Support a Steam Pipe Across a Span When Upright Supports Can Not be Used.

Conditions sometimes arise wherein an overhead steam pipe must be supported between structures. This could easily be done by the use of uprights. However these uprights may interfere with traffic or manufacturing processes as, for instance, where cars are run in or adjacent to a building. Figs. 1 and 2 show how this may be overcome by a pipe saddle located at the middle of the span. Rods are passed through this saddle and anchored to the buildings at each of their ends. Adjustment is made by means of turnbuckles.

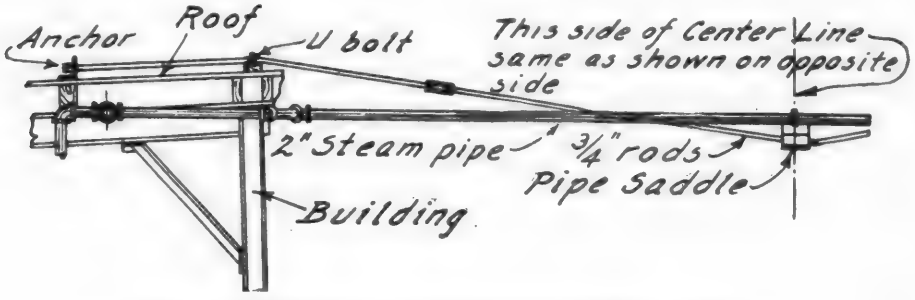


FIG. 1—SUPPORTING A STEAM PIPE ACROSS A SPAN.

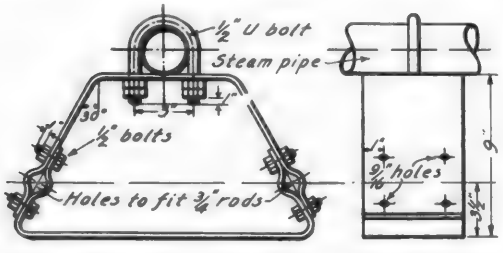


FIG. 2—DETAIL OF SADDLE FOR PIPE MIDWAY BETWEEN STRUCTURES.

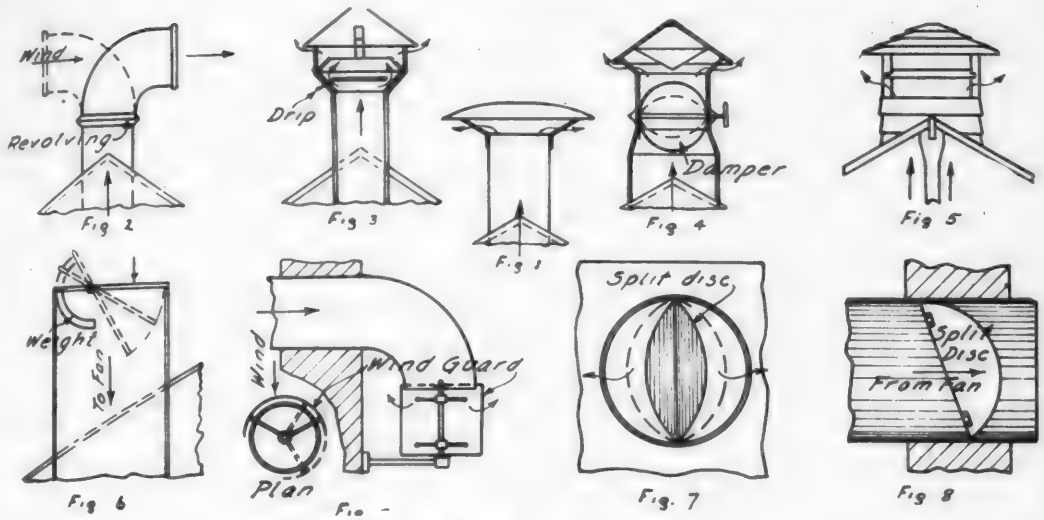
Ventilators for the Roof.

In selecting roof ventilators something simple is desired. Those dependent upon the wind are often in operation when not required or vice versa.

Fig. 1 answers to the requirement of simplicity. In Fig. 2, the revolving type is shown. It is pivoted and fitted with a vane which keeps the outlet at all times on the lee side. In this way ventilation is effected by induction.

Fig. 3 is a simple stationary ventilator of galvanized iron with interior diaphragm for the collection of snow and rain. This is provided with a drip to the outside. The annular space around the diaphragm should be slightly in excess of the duct area. Fig. 4 is similar with an addition of an adjustable damper, operated from below, as desired, for up-draft or prevention of down-draft.

Fig. 5 shows a common type of ventilator constructed of wood with louvres stationary or adjustable. Fig. 6 shows a form of automatic fresh-air intake for non-return of cold damp air at night in weaving sheds, when the fans are stopped. The disc at the top opening hinges unequally with the smaller side, weighted to balance



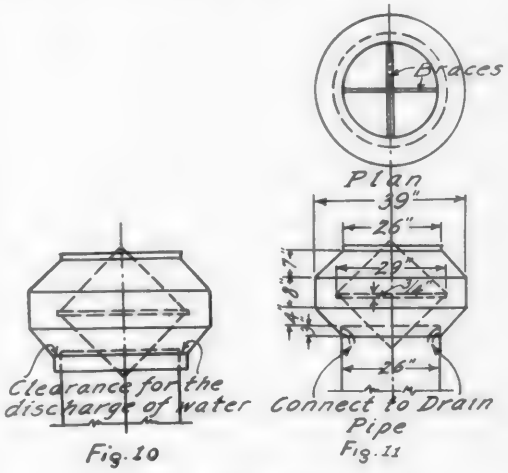
TYPES OF ROOF VENTILATORS.

Fig. 1—Simple Ventilator. Fig. 2—Revolving Ventilator. Fig. 3—Ventilator with Diaphragm to Collect Moisture. Fig. 4—Ventilator with Damper. Fig. 5—Ventilator with Louvres. Fig. 6—Automatic Non-Return Ventilator. Figs. 7 and 8—Automatic Ventilator with Split Disk. Fig. 9—Ventilator with Wind Guard.

pressures equal within and without. During the day atmospheric pressure opens the disc to admit air as required by the suction of fans. Figs. 7 and 8 are two views of a ventilator similar in action except that it affords passage for air from a fan. The disc is split into two halves which incline backwards towards the top. It is installed in a horizontal duct and opens as shown in Fig. 7.

The condition of wind pressure, where outlets are exposed, may be remedied as shown by two views in Fig. 9. The outlet is curved downwards and provided with a half circle wind guard which may be adjusted in opposition to wind from any direction.

Vent hoods of the internal-cone type are shown by Figs. 10 and 11, the hood shown in Fig. 10 being for exposed locations above the roof; that shown in Fig. 11 is for use when installed in a cupola. In one case clearance is shown for the discharge of rain water, by a projection of the duct. The water collects and is drained through pipes which, being inside of the duct, are prevented from freezing. The interior cone is larger in diameter than its connection to the duct work, in order to prevent rain or snow from entering. The ¾-in. lipped edge, as shown in the sketches, is used to direct the water directly downward, thus preventing it from travelling inward to the lower apex of the inner cone. Drainage pipes for exposed ventilators should not be used since these readily freeze up due to the water being formed slowly. The free area throughout should be equal to that of the connecting duct.



TYPES OF ROOF VENTILATORS.

Fig. 10—Ventilator of Internal-Cone Type, for use when exposed above roof. Fig. 11—Ventilator of Internal-Cone Type, for use in a cupola.

Provision for Expansion in the Use of Cast-Iron Flanged Pipe.

In the use of cast iron flanged pipe (pipe cast with flanges), provision must be made for expansion and contraction where the branches leave the main to connect to fixed

points of engines and other steam using machinery. The main may be of cast iron but the branches should be of screwed wrought pipe. This is installed with ells so as to turn slightly in the threads as in a swing joint.

Joints for Duct Work.

The noise of fans or their motors is readily telephoned along sheet metal ducts; consequently to avoid a rigid connection from duct to fan outlet it is necessary to insert a 10-oz. canvas sleeve of double thickness about 8 in. long. (Fig. 1.) This sleeve should be smoothly constructed and each thickness of the canvas should be painted four coats of best lead and oil paint.

Round pipes should be heavily beaded and riveted. For rectangular pipe less than 40 in. in greatest dimension, lock seams and stock strip joints may be used, if properly constructed. Locks seams are not so objectionable in vertical pipes. Flues of greater width or depth should be made with standing roundabout seams every 30 in. A good practice is to make ducts with standing seams having separate cleats mitering at the corners, as shown in diagram "H".

The following form of seams are largely used in commercial work. A flat lock seam is constructed as shown in sketch "A". Sketches "B" and "C" show single and double-lock standing seams.

Large and heavy ducts or flues should be constructed with angle-iron bracing at the joints, as shown in sketch "D", the angle irons being 1-¼ in. or 1-½ in. by ⅛ in. steel. Such joints should be placed not more than 48 in. apart.

Ducts constructed of heavy iron No. 14 gauge or heavier, should be constructed with the corners framed on ½ in. by ⅛ in. angle iron, as shown in sketch "E".

Poor workmanship often results from the use of slip joints put together as shown in sketch "F", but such work should not be permitted.

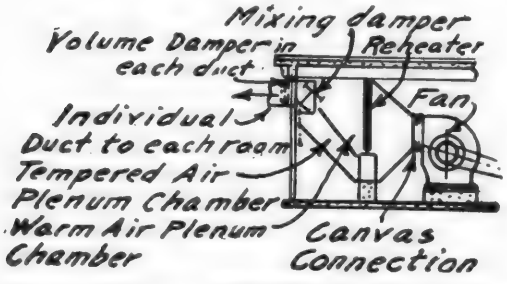


FIG. 1—CANVAS CONNECTION FROM FAN TO DUCT.

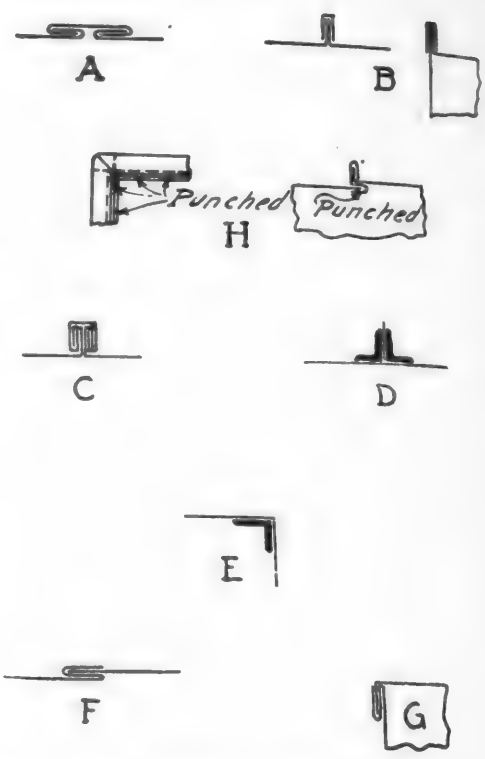


FIG. 2—JOINTS FOR DUCT WORK.

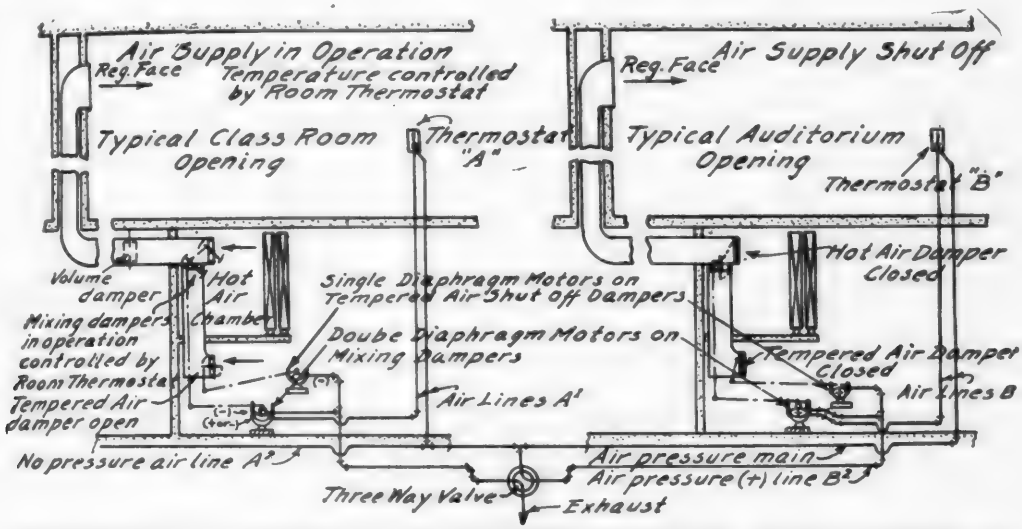
Large ducts when not made with angle-iron joints, should be braced with 1-¼ in. or 1-½ in. by ⅛ in. angle irons carried transversely around the ducts six or eight feet apart. The sheets are 8 ft. long and thus the joint in large ducts may be made as shown in sketch "G", avoiding the use of other bracing.

Indirector radiator casings should be constructed of No. 22 galvanized iron, using double-lock standing seams. They should be substantially supported and put together with the stack strips and bolts in such a manner as to be readily removed without breaking pipe connections and to permit access to the heaters. Casings should be of double construction which allows for the insertion of ½ in. 85% magnesia blocks. At the side or end of each stack casing provide two heavy 8 in. by 12 in. swinging clean-out doors with suitable catch plate placed in a convenient position. Install one of these doors near the bottom of the casing, the other near the top. The air space over and below the indirect radiator should not be less than 12 in.

Automatic Temperature Regulation for the Individual Duct System.

With automatic temperature regulation for the individual duct system it is frequently desired to switch the air control from class room to auditorium or vice versa. This necessitates an arrangement of connections as shown in the diagram.

With air cock in position shown, all air supply is shut off from auditorium system while the class-room system is in operation, controlled by the room thermostat. A quarter turn of the three-way valve reverses the conditions in the two systems.



ARRANGEMENT OF CONNECTIONS FOR SWITCHING AIR CONTROL FROM CLASSROOM TO AUDITORIUM

The temperature of the class room and auditorium are each controlled by a room thermostat. For each room the mixing dampers are controlled by the room themostat acting through a double-diaphragm motor, while the tempered air damper is actuated by a single-diaphragm motor.

Concealed or Recessed Radiators.

In residences, hallways, vestibules and lobbies of public buildings, it is frequently required that all or a portion of the radiators be concealed in enclosures. While this method may be desired for space conditions and esthetic reason, it decreases the efficiency of the radiators. This must be offset by the installation of an increased amount of radiation, the increase being dependent upon the design of radiator enclosure.

The enclosure as shown by Fig. 1 should be so constructed that the space under the radiator is equal to the depth of the radiator, while the space over the top of the radiator is equal to the depth of the enclosure. The space between the radiator and the casing of the enclosure should be 1 in. at both back and front. The entire enclosure should be lined with galvanized iron of at least No. 24 gauge. Asbestos sheets, ¼ in. thick, are placed back of the lining. The enclosure is provided at the bottom of the radiator with an air-inlet register and at the top with an air-outlet register. Five square inches per square foot of radiation are allowed for the area of the bottom register face and 6 sq. in. for the top. These figures are based on a register face designed for 75% free area of

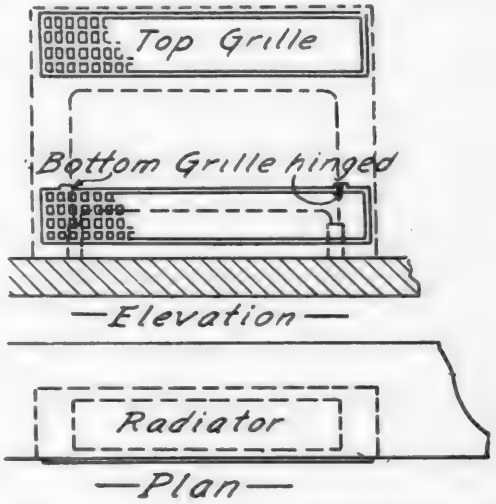


FIG. 1—RECESSED RADIATOR WITH REGISTER INLET AND OUTLET.

the gross area opening. If the free area is less, the total area of the register face should be increased proportionately.

The top of the bottom register face should not be above the bottom of the radiator, and the top of the upper register face should be at least the depth of the

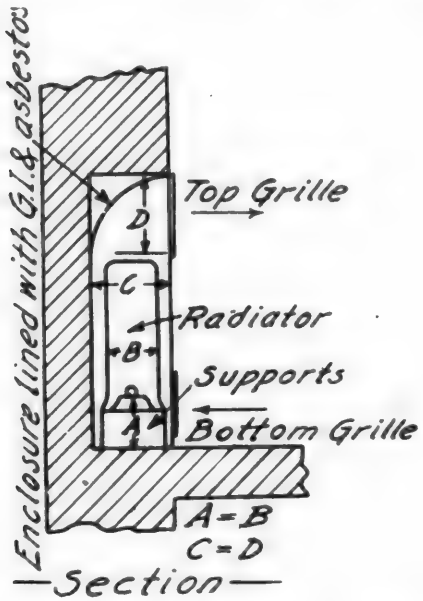


FIG. 2—SECTION OF RECESSED RADIATOR WITH REGISTER INLET AND OUTLET.

radiator recess above the top of the radiator. Where the outlet register face is placed considerably above the top of the radiator, the effect of the flue extension will increase the velocity of air through the radiator, and, therefore, the efficiency of the latter. Where the entire face of the radiator is covered with a grille, as in Fig. 2, the bottom of the latter should be below the bottom of the radiator. The top of the grille should extend the depth of the recess above the top of the radiator.

A recess radiator must be from 20% to 40% larger than an exposed radiator in order to secure the same heating effect. This ratio of increase depends upon the air inlet and outlet, whether ample or restricted.

When grilles are installed, provision must be made for access to the radiator valves.

Modern Housing Schemes and the Heating Question.

A new scheme for heating and ventilating houses which form part of extensive housing enterprises was proposed by Professor Leonard Hill, in a recent address before a conference held by the British Commercial Gas Association Professor Hill's scheme is especially for use in workshops and other large rooms. It consists of a device for propelling the outside air by means of fans through inlets extending at a 3-ft level all round the walls, the air being extracted through a number of vents in the ceiling by means of an exhaust fan.

Heat in cold weather is to be provided by multiple units of radiating surface, each with separate control, and individually so small as not to affect unpleasantly anyone working near them.

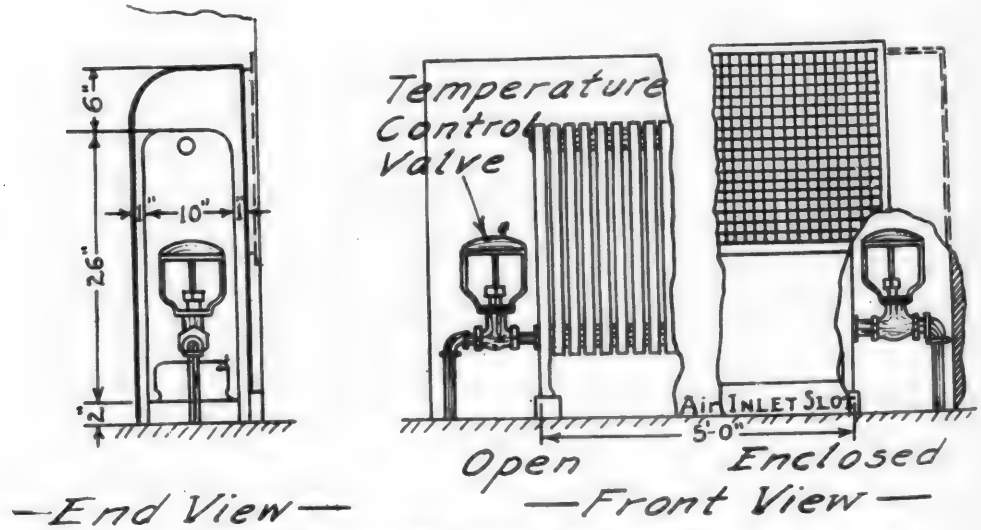


FIG. 3—RECESSED RADIATOR WITH GRILLE FRONT.

For ordinary domestic heating, Professor Hill recommends the gas fire as having all the hygienic advantages of the coal fire, with none of its defects. The principal reason for his advocacy of this method is the fact that the gas log heats largely by radiation and this keeps the air comparatively cool. Professor Hill laid especial emphasis on the necessity for cool, moving air in all living and working rooms.

THE RECONSTRUCTION ERA

For National Department of Public Works.

Bills to change the name of the Department of the Interior to the Department of Public Works, which shall then have charge of all constructon work for the government, have been introduced in the Senate and House. The bill is the result of the deliberations of the Enginers, Architects and Construction Conference on National Public Works, which met first in April.

Bill "For Relief of Contractors" on Government Work.

An important bill has been introduced in Congress to reimburse contractors and their sub-contractors, including material men, for the construction of post-offices and other buildings under the supervision of the Treasury Department, for increased cost due (1) to increased cost of labor or materials, (2) to delay on account of the action of the United States Priority Board or other governmental activities, and (3) to commandeering by the government of plants or material shown to have been caused by war conditions alone. The bill is intended to provide relief for contractors who through no fault of their own have suffered or will suffer loss on account of the completion of contracts entered into with the Treasury Department before the war.

The bill was referred to the Committee on Public Buildings and Grounds, which has recommended it for passage.

Centralized Credit Organization Proposed to Supply Europe's Needs.

Plans for the protection of the American public in lending its money to Europe for rehabilitation, as outlined by James S. Alexander, president of the National Bank of Commerce, in New York, provide for a pool of Europe's needs to be met by a pool of America's resources. He believes that America's resources should be applied to Europe's needs through a great, centralized credit organization. The necessary credits will be so great, he adds, that they must be carried to the investing public in the form of bonds or debentures. The security behind these debentures should make them almost equal to Government bonds in point of safety and must be based on everything in the way of collateral that Europe is able to offer.

Permanent Organization of National Research Council.

The National Research Council, which was formed at the instance of President Wilson during the recent war, has been reorganized on a permanent basis for promoting research among the industries of the country. Quarters for the Division of Engineering of the council have been secured in the Engineering Societies Building, New York, with Galen H. Clevenger in charge.

The Division of Engineering comprises four sections, including a section or metallurgy, one on mechanical engineering, one on electrical engineering, and one on prime movers. Heating and ventilating engineers will be interested more particularly in the Mechanical Engineering Section which has a drafting room at Research Council headquarters. Through the generosity of the Carnegie Institute of Technology, a machine shop is also at the disposal of the section.

Special attention is called to the fact that the Engineering Division is not to be regarded as an instrument of research, but rather a stimulator and co-ordinator of research. Its principal object is to get

more and better research done in engineering. At present the division is carrying on its work largely through committees. It now has some 14 committees working on a variety of subjects.

National Association of Master Plumbers Backs Trade Extension Campaign.

Substantial support of the Trade Extension Campaign was given by the National Association of Master Plumbers, at its recent annual convention in Atlantic City, when it voted $1,000 as its contribution towards the campaign.

The convention took up, among other things, the establishment of a Mutual Liability Insurance Company, to be formed from its membership, to take care of the obligations incurred through the Workmen's Compensation Law. It was pointed out that where such laws are in effect, it is necessary for business men to carry liability insurance and the rates for this class of insurance are especially high. One of the local associations of master plumbers has already solved the problems of liability insurance through the organization of a mutual company, and is providing its members with this service at a very nominal cost. It was voted to appoint a committee to investigate the matter with a view of forming a national mutual liability insurance company.

Another suggestion, contained in the address of President McNamara, was that the association establish a membership department to obtain a record of non-affiliated master plumbers throughout the country and adopt a system of form letters to be mailed them at regular intervals, with a view of securing their applications for membership. This was referred to the incoming board of directors.

A proposition out of the ordinary was presented by the board of directors looking towards closer co-operation between the employers and the workmen. The board recommended that a committee be appointed to serve with a like committee to be appointed by the United Association of Journeymen to study the various questions affecting the common interests of the two organizations and make recommendations for the common good. It was proposed that such a committee be known as the Reconstruction Committee. This proposition was favorably acted upon, after a spirited debate.

New officers were elected as follows: President, Frank B. Lasette, New York; vice-president, D. F. Durkin, Jr., Philadelphia; treasurer, John Trainor, Baltimore. John R. Hopkin, New York, was appointed secretary and John E. Dugan, Albany, N. Y., executive secretary.

It was voted to hold the 1920 convention in Pittsburgh.

Master Fitters Plan Standardization Program.

In the report of the Board of Directors of the National Heating and Piping Contractors' Association, presented at its recent convention in Atlantic City, it was stated that during the coming year the association's Committee on Standardization will undertake to write a uniform specification for various classes of piping work at different operating pressures. Attention was called to the fact that the American Institute of Architects has adopted a uniform contract and general conditions which precede the detail specifications for a given job. There is no reason, it was stated, why specifications also should not be standardized. Certain branches of the government, as well as some of the State and municipal architectural departments have adopted standard specifications as a basis for contract work.

Test pressures on the completion of a piping job, stated the report, run all the way from working pressures up to bursting pressures. Few engineers know when to use a globe valve and when a gate valve, and many an argument has resulted from this one question. Most architects, and engineers, after spending six months in carefully designing a plant in all its details, allow the contractor seven hours to look at the plans, seven days to figure the job, and seven weeks in which to complete it under heavy penalty.

"Specifications and plans," it was stated, "show the capacity of a heating apparatus as designed by the engineer, but the contract puts the guarantee for successful operation and complete responsibility for the design, upon the shoulders of the contractor. This is not legal, but most of us, as a matter of business policy, go to the additional expense to make a job right, rather than avail ourselves of doubtful legal protection. Surely there is room for more co-operation and for a more complete understanding of each other's problems between the architect or consulting engineer and the heating contractor. The standardization of specifications for work is unquestionably worth our best efforts."

Stewart A. Jellett, for the associations' Standardization Committee, presented a proposed standard contract form for the use of the heating trade.

Co-operation Between Heating and Plumbing Contractors.

For several years a movement has been under way looking towards closer co-operation between the heating and plumbing contractors. Committees representing each industry have worked together as a Joint Conference Committee. During the period of the war little was done by this joint committee but at a recent meeing several subjects were taken up and will probably engage the attention of the conference committee during the coming year.

One of these subjects was the impropriety and unfairness of submitting informal bids. It was voted to be the consensus of the committee that in submitting bids on regularly and properly-drawn plans and specifications, members of the respective associations should adhere strictly to said plans and specifications and refrain from submitting informal bids based upon the use of substitutes.

The matter of "overhead expense" was also considered and it was voted to send out new printed matter on this subject to the trade.

It was also voted that the following matters be submitted to the conventions of each association for consideration and action:

1. How payments on contracts may be so arranged that the retained percentage shall dcerease as the work approaches completion.

2. How specifications may be arranged so that work required for any trade shall be completely grouped under the heading for that trade and not scattered at random throughout the entire set of specifications.

3. Continued advising of the feasibility and desirability of separating contracts for the mechanical equipment of buildings (such as heating and ventilating systems, plumbing, sprinkler systems, elevators, electric work, vacuum cleaners, etc.) from general contracts.

4. The cost of Workmen's Compensation Insurance should be charged up to the owner on all percentage or day work, as part of the cost, just as it is in making up estimates for contract work.

5. There should be greater clarity in specifications, to the end that contractors should not be expected to fix a definite price for an indefinite operation and that "blanket clauses" shall be eliminated.

Engineering Council to Urge Higher Compensation for Engineers.

Based on the fact that salaries of engineers have not increased to proportionately the same extent as the prices of the necessaries of life and that the present high prices of the necessaries of life may continue for probably several years, the Engineering Council through its committee on Classification and Compensation of Engineers, is now actively engaged in securing data upon which to base its final report favoring higher standard rates of compensation for professional engineers.

In a preliminary report, reference is made to a record of average prices of the necessaries of like kept by R. G. Dun & Co., which shows that prices have increased continuously for 22 years. A certain quantity of staple necessities which could have been purchased July 1, 1897, for $72.45, by January 1, 1905, cost $100.32. On January 1, 1914, before the outbreak of the war, the cost had risen to $124.53; May 1, 1917, to $208.43, and October 1, 1918, to the maximum of $233.23.

It is pointed out that this enormous increase in prices of the necessaries of life has been accompanied by an increase in wages among workers organized in unions which had the power to compel attention to their demands, but that no such increase has taken place in the compensation of salaried workers in the professions.

"It has been assumed," continues the report, "that these workers, living in a different social environment, had a margin of compensation sufficient to enable them to meet the increased cost of living. This assumption, however, is not justified by the facts. Where salaries have been increased during the past three years, there are few cases in which the increase has been at all commensurate with the increase in prices of the necessaries of life, which the salaried worker, like the wage worker, has had to purchase.

There has been a general belief that with the coming of peace and the resumption of productive industries, a heavy fall in prices would occur. It has been assumed that the salaried worker would have to wait for this so that he could again live within his income. It now appears, however, to be the opinion of many financiers and economists that the present high prices of necessaries are likely to continue for a long time, probably for several years. If this is so, then surely the salaried worker, in a professional or any other occupation, has an equitable claim to have his compensation brought back in purchasing power to where it was fifteen years ago.

There is another aspect of the com-

pensation of the professional worker which has been frequently misunderstood, but which with present knowledge ought no longer to deceive. The pay of professional engineers has for many years been influenced by the idea that a young man in the earlier years of his work should expect moderate compensation because of the future to which he might look forward. There was justification for this idea during the period when the development of engineering was so rapid that a large proportion of the men who were turned out from the few engineering schools or the engineering workships were able eventually to rise to positions of large responsibility and importance, commanding high salaries. That condition has now been altered. Of the men who begin technical engineering today, only a very few selected ones can rise to positions of responsibility commanding high salaries. The man of exceptional ability, indeed, may find it worth his while to work for low compensation because of the future awaiting him. But to hold up to the rank and file of technical workers the idea that they can aflord to work for insufficient salaries for the sake of some future high position, is a gross deception.

The committee believes, therefore, that in adopting standards for the compensation of workers in all technical fields due consideration should be given to the great increase in the cost of living. The dollar of salary must be considered with regard to what it will purchase today and is likely to purchase next year, and not with regard to the value of the dollar ten or fifteen years ago. This increase in compensation is necessary not merely as a matter of justice to the engineer, but in order that engineering work may be maintained on the plane that it must be to secure economical and efficient work. There is no economy in paying such men at rates inadequate for their support, for this leaves their minds burdened with anxieties, when they should be free to give their best efforts to the work in hand. Moreover, such a rate automatically tends to drive the abler men into other occupations and to leave in charge of the work only those of less ability. The committee has therefore recommended that it be directed to formulate a definite classification for each of the services under consideration and a schedule of compensation which might reasonably be fixed for positions in each class.

Merchants' Association of New York Looks for Continuation of High Prices and Wages.

The Merchants' Association of New York believes that

The present level of prices and wages will be maintained indefinitely.

Increased industrial activity throughout the world, with a shortage of labor tending to rising wages and higher selling prices, are inevitable.

Manufacturers must realize profits through increased efficiency in production, with the co-operation of wage earners.

The housing shortage cannot be relieved until more houses are built under normal conditions which will ensure a profit.

These are some of the conclusions reached by The Merchants' Association after consideration of a report made by its Housing Committee.

Expense of Distribution as the Main Factor in the High Cost of Living.

In a thoughtful discussion of the high cost of living, which appeared recently in the National Civic Federation Review, the author, William H. Ingersoll, takes the position that the expense of distribution is the principal factor that is keeping prices high, or rather that prices will continue high until we find a better and more economical method of distribution than than we now have.

After analyzing the modern machinery of distribution through producer, wholesaler and retailer he proposes an improvement in the present system, rather than the substitution of a new system. As regards the "grasping middleman," for instance, he says, "we have not discovered an exorbitant profit absorbed by the 'grasping middleman.' Personally, we know the dealer to be much like other men, we know him as a neighbor and a citizen, and we know that usually he works hard without getting rich."

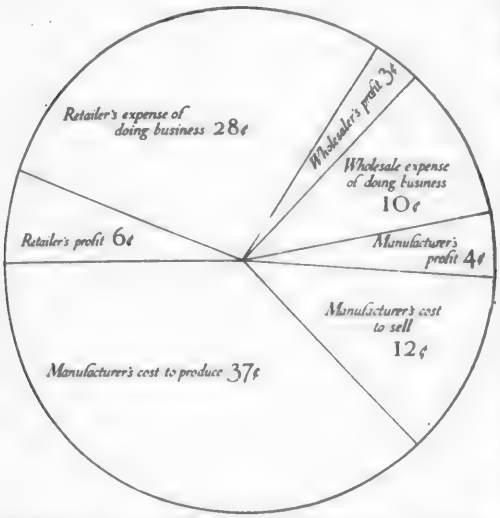
"The one unreasonable condition that our analysis has disclosed," he says, "is the expense of distribution; not the multiplicity of unproductive functionaries that may easily be eliminated, nor the burdensome profits so often suspected. But our distributors do spend too much to do the job.

"The accompanying chart indicates that 50 cents out of each dollar goes for the manufacturers' and middlemen's selling expense. Our next suspicion might be that while we cannot dispense with the wholesaler or retailer, that there may be

too many of one or both to be supported economically in the field. While I believe that there would be a small net gain if the number were reduced by half or two-thirds with sturdier size for the remainder, there has not been an advantage with size or concentration of trade to warrant hope on this ground alone.

"But a saving of expense could be realized by greater skill and efficiency on the part of the distributors. We suffer from too great an investment in stagnant stocks.

"As a practical matter the largest factor in the high expense percentage of operating stores, is the slow turnover of stocks. The fixed expenses have to be charged against too small a volume of business. The country pays interest and operating charges on too great an investment in stocks in proportion to the business done. The solution lies in cutting down the stocks without reducing the amount of sales,—doing the business on a small investment. Increasing the size of the business does not reduce expense percentage if the stocks increase proportionately. Size alone only makes for complication and lost motion as is shown by the higher expense of the department store compared to the smaller store. Quick turnover means lower expense.


Retailer's expense of doing business 28¢
Wholesaler's profit 3¢
Wholesale expense of doing business 10¢
Retailer's profit 6¢
Manufacturer's profit 4¢
Manufacturer's cost to sell 12¢
Manufacturer's cost to produce 37¢

WHERE THE CONSUMER'S DOLLAR GOES. BASED ON 40 STAPLE AND SPECIALTY PRODUCTS.

"The secret is to make slothful dollars in idle stocks get busy, start rolling and yield a return.

"If goods cost less through true savings, there would be purchasing power to absorb more of them. More goods would be sold. More therefore would be produced. Employment and earnings would be greater and also would buy more per dollar.

"How then can this better standard of distribution be reached? Only through the gradual and painful process of research and education. Society now provides no means by which skill and training can be acquired on the part of those who do the work which consumes more than half of all that our money goes to purchase. Great study and preparation goes into production. Technical and engineering and mining and agricultural schools give the result of research, experience and correlation for the benefit of those taking up the work of production. And society in return gets the benefit of skilled operations—at least, it is beginning to."

LEGAL DECISIONS

Waiver of Stipulation in Heating Contract.

A heating contract provided that upon the contractor's nonperformance, the owner, upon the architect's certificate, could terminate the contractor's employment and complete the work, and that damage incurred should be audited and certified by the architect. The Wisconsin Supreme Court holds, School District v. Blystone, 170 N. Y. 721, that this stipulation was waived by the contractor and the surety on the contractor's bond, where the contract to complete the work was let to another company at the surety's suggestion, after the surety had elected not to complete the contract itself and work was completed without objection on the part of the contractor. Such a stipulation is held to be mainly for the owner's benefit, and waiver thereof by the contractor may be inferred from less significant circumstances than waiver on the part of the owner.

Whether Heating Plant Part of Realty or Not Here a Jury Question.

The Minnesota Supreme Court, Cohen v. Whitcomb, 170 N. W. 851, in a contract between landlord and tenant, had before it the question of whether or not a heating plant installed by a tenant became a part of the realty. M. leased the premises in 1905 to S. for 12 years, the lease providing that "any improvements, repairs or alterations" made by the lessee in or to the building should become the property of the lessor and not be removed at the termination of the lease. In 1907 S. as-

signed the lease to the defendant, Whitcomb, and thereafter M. conveyed the premises to the plaintiff, Cohen, subject to the lease. There was no heating plant in the building, and during his occupancy S. installed a hot-air plant therein, but before assigning the lease removed it.

After taking over the lease the defendant put a new front in the building and made other repairs and improvements. He also installed a water heating plant therein, the furnace and boiler of which were placed in the basement upon a foundation built level with the floor. The pipes in the basement were hung on loop chains; above the basement the radiators and pipes were hung on brackets screwed to the wall; the feed pipes through openings in the floor, around which were placed escutcheons; and the tile floor was built up snug to the openings. The pipes and other parts were connected by means of ordinary couplings and bolts, so that the plant could be taken apart without in any way injuring the building.

Shortly before the expiration of the lease the tenant disassembled the plant preparatory to its removal, whereupon the owner of the premises brought this action to enjoin him from so doing, and for damages to the freehold. The tenant, by way of counter-claim, set up that he was the owner of the heating plant, and that the landlord had unlawfully converted it to his use, and demanded damges therefor.

It was held that to come within the provision of the lease, any improvements must have been to the building, to the realty. The clause gave to the landlord only those improvements, repairs, or alterations which became a part of the realty, and had no reference to removable fixtures. If the heating plant were a removable fixture, placed in the building by the tenant with the evident intention of removing it at or before the expiration of the lease, then the plaintiff would not be entitled to recover in the action. Whether the heating plant was so affixed to the realty as to become a part thereof was held to be a question of fact for the jury.

What was meant to be understood by the words "improvements, repairs or alterations" was indicated and limited by a later clause in the contract, which provided that at the termination of the lease "no part or appurtenance of said buildings shall be removed," clearly implying that all articles not appurtenant, not a part of the realty, might be removed. The removal of the plant left the building in just as good condition and repair as it was in at the time of the making of the lease. Had the building contained a heating plant at that time, quite a different question would have been presented. In that case the presumption would naturally have been that a new plant was a substitute for the old and should have been left upon the premises. Unless the plant became a part of the building it was difficult to understand how it could constitute an improvement thereto, under the lease. The jury found for the tenant and judgment in his favor was affirmed.

Current Heating and Ventilating Literature.

Under this heading is published each month an index to the important articles on the subject of heating and ventilation that have appeared in the columns of our contemporaries. Copies of any of the journals containing the articles mentioned may be obtained from THE HEATING AND VENTILATING MAGAZINE *on receipt of the stated price.*

CENTRAL-STATION HEATING

Central-Station Heating in Detroit. J. H. Walker. Mech. Eng., vol. 41, no. 6, June 1919, pp. 497-503, 8 figs. 40c.

EQUIPMENT

Care of Heating and Ventilating Equipment—IX, Harold L. Alt. Power, vol. 49, no. 18, May 6, 1919, pp. 675-679, 9 figs. Several vapor systems are taken up and their characteristics explained, together with information regarding some of the special apparatus used with each. 20c.

FLUES, CHIMNEY

Notes on Chimney Flues, Hnery N. Dix, Am. Architect, vol. 115, no. 2259, Apr. 9, 1919, pp. 530-534, 6 figs. Causes of poor draft. 30c.

INDUSTRIAL HEATING

Saving Steam in Industrial Heating Systems. Dept. of the Interior, Bur. of Mines, tech. paper 221, 14 pp., 7 figs. Calls attention to faults of design and operation which lead to uneconomical use of live steam for heating and other purposes. Reprint of Eng. Bul. no. 6, prepared by U. S. Fuel Administration. 40c.

LAYOUT

A Problem in Piping Layout, James Leslie Lane. Boiler Maker, vol. 19, no. 4, Apr. 1919, p. 93, 1 fig. Mathematical computation of angles and lengths of lines. 30c.

THEATER VENTILATION

Theater Ventilation From a Health and Business Standpoint, E. Vernon Hill. Domestic Eng., vol. 87, no. 6, May 10, 1919, pp. 237-239 and 270. Mechanical equipment is judged necessary, and its installation profitable to contractor and owner. 20c.

Tendency Toward Drastic Legislation for Inspection of Heating Boilers.

News items from time to time have told of bills introduced in some of the State legislatures which would require the employment of licensed firemen for the operation of house heating boilers, but how near the trade has come to being saddled with this kind of legislation was not generally realized until F. W. Herendeen, secretary of the National Boiler and Radiator Manufacturers' Association, told in detail of the developments in this connection at the recent convention of the Heating and Piping Contractors' National Association.

As a matter of fact, no law has been written that requires low-pressure heating boilers to be attended by a fireman who has been granted a license by the State, but there seems to be a feeling, as Mr. Herendeen stated, that States desire to write laws compelling annual inspection of low-pressure heating boilers at a fee of from $2.00 to $10.00 a year, and to require the owner of such boilers to have them attended by licensed firemen. Mr. Herendeen adds the interesting comment that perhaps upwards of 2,000,000 low-pressure heating boilers were functioning this past winter in the United States, and it would appear rather preposterous to believe that suddenly an enormous danger to life and property had arisen because of low-pressure steam boilers.

Much of this agitation, he believes, may be attributed to the desire of State Inspection Departments to perpetuate themselves politically. "In the final analysis," he states, "I believe the reasons that licensed firemen bills are being introduced is not because low-pressure heating boilers require licensed firemen, but because licensed firemen are supposed, by reason of State examination, to know more about a boiler and are, therefore, enabled to command a higher wage."

The boiler and radiator manufacturers' association has steadily maintained its position of classifying low-pressure heating boilers as those carrying a pressure of 15 lbs. per square inch or less, and water heating boilers and hot-water supply boilers as those carrying a pressure of 30 lbs. per square inch or less and that they should not require State inspection and should not require licensed firemen to operate them.

Mr. Herendeen cited a number of cases where effective action had been taken by his association and other bodies in blocking proposed boiler inspection laws and gave the details of four concrete instances out of fifty or sixty that have come before the various State legislatures.

How an Engineering Society Should Be Conducted.

For some time it has been felt that American engineering societies were not getting the most out of their organization and were not as useful to their members as they might be. In a recent report of a committee representing the American Society of Mechanical Engineers, presented at the Society's recent meeting in Detroit, it was brought out that it is not only the engineering societies which are having their problems in this connection, but that the same thing can be said of the universities and technical schools. In an effort to get at the root of the trouble a number of questionnaires were sent out, resulting in a mass of information, criticisms and suggestions.

THE "ADOPTION" OF STANDARDS RECOMMENDED.

Perhaps the most important conclusion reached by the commitee was that the society should "approve and adopt such professional reports and standards as shall from time to time be presented to it." The purpose of this change, it was stated, is to permit the society to adopt an active, progressive policy in place of the present passive policy.

On the subject of research and standardization the report recommended the increase of appropriations made from the society's own funds to further research, besides obtaining funds from other sources for this purpose; also the determination and formulation of problems requiring investigation, and the securing of men and facilities to solve these problems.

In connection with the adoption of standards the committee recommended further, that in general such standards be limited to elements, and that the standardization of combinations be left to organizations devoted to special industries, all such standards to be considered as progressive standards and not ultimate ones.

Industrial engineering, in the opinion of the committee, is a major subject for consideration by the society, and should be placed on a par with all other major technical subjects.

NEGLECTED OPPORTUNITIES IN CONNECTION WITH INDUSTRIAL TRAINING.

The committee expressed the opinior that the society is not realizing its opportunities in connection with industrial edu-

cation below the grade of college work and recommended the formation of a strong committee to take up this activity vigorously. The reason for this recommendation, it was stated, is found in the need of the engineer for trained subordinates and industrial workers.

PUBLICATION OF HANDBOOK URGED.

Another important recommendation was that the society publish, as soon as practicable, a handbook of mechanical engineering data.

NEW CODE OF ETHICS PROPOSED.

Sharp criticism of the society's present code of ethics was contained in the committee's suggestion that the present code of ethics of the society "be abolished as unnecessary and unenforceable." This was later changed, by vote of the society, to read "it is the sense of this meeting that a short code of ethics of broad scope, general character and positive rather than negative injunction, be prepared and that the same be enforced vigorously."

PLAN FOR INCREASING THE INFLUENCE OF ENGINEERING SOCIETIES IN COMMUNITY AFFAIRS

In the opinion of the committee, the relations of the engineer to municipalities can best be cultivated through group activity. It was suggested that such proper groups are the local and general engineering societies which take in engineers of all classes. In State affairs, it is proposed to act through a coalition of such groups into State Associations, while matters of general and national interest may be handled by a national organization of such local, district and State societies.

It is not proposed to do away with the various local sections of technical societies, but that they should form part of the local general engineering societies. In dealing with public affairs their members should act as members of the general engineering society and not of the technical section.

Distinctly technical work, such as the formulation and publication of safety codes, the fixing of standards, etc., should be done by those technical societies which, jointly or severally, are concerned with the particular subject. But the agencies for bringing about their general adoption and legalization should be the general engineering societies, local, district, State and national.

All of the important engineering societies now have local sections and the committee's specific recommendation is that there be created some agency of a national character through which the cooperation of local groups, State groups and national societies can be secured for purposes of national scope.

Acting through the organizations above suggested the committee then went on to suggest definite work that could be undertaken, such as the adoption of safety codes, establishment of standards of size, strength and quality of manufacture of products, of standards of material and standard method of testing materials and performances; initiating and guiding legislation for the operation, development and conservation of industries, utilities and national resources owned or controlled by communities, and, particularly, by developing and securing the adoption of uniform systems of accounts and reports of public utilities, both privately and publicly owned.

Other suggested lines of action were the securing of uniform State and federal laws for the registration and certification of professional engineers whose work involves the public health, safety and well-being; the placing of engineers in public positions, requiring engineering training, through appointment rather than election. In the same connection it was urged that engineers in public positions should be encouraged to become members of the local general engineering bodies, while such societies, on their part, should lend their support when political or other influences seek to interfere with the proper exercise of the functions of such engineers. Incidentally the reports of such engineers may be made profitable and mutually helpful subjects of discussion and review by such societies.

The organization here outlined, continues the report, would be of special service in the selection of engineers to meet public emergencies.

Enforcement of the law could be secured more effectively by action in conjunction with other civic bodies, rather than independently. Public opinion, also, could be better molded by an active, but dignified program of education in the public press. This, it is stated, should be free from objectionable advertising and of a character which would broaden the public knowledge of, and its appreciation for, engineering achievements.

Finally the committee mentions the opportunities, with such an organization, of participating in the solution of the industrial problems now before us.

AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS

Election of Officers of Massachusetts Chapter.

At the annual meeting of the Massachusetts Chapter, held at the Exchange Building, Boston, Alfred S. Kellogg was re-elected president of the chapter. Other officers are: vice-president, Allen Hubbard; secretary, A. C. Bartlett; treasurer, William T. Small. The chapter will resume its meetings early in September.

New York Chapter Urges Government Support of Working Conditions Service of Labor Department.

Acting upon the statement of Grant Hamilton, director of the Working Conditions Service of the Department of Labor, made at the chapter's annual dinner, that the Service was in danger of being forced to cease its activities through the failure of Congress to vote the necessary appropriation for its continuance, Secretary E. A. Scott of the New York Chapter sent out a letter urging the members to write to their congressmen urging them to use their influence towards securing the desired appropriation.

A Correction.

A statement made in the July issue that Professor S. E. Dibble had been appointed a member of the heating engineers' society's Committee on Research, "filling the place left vacant by the death of the late William F. McDonald, of Detroit," was in error, as Professor Dibble was already a member of this committee, having been appointed by President Walter S. Timmis at the society's last annual meeting.

Proposed Memorial to Professor R. C. Carpenter.

Since the death of Professor Rolla C. Carpenter, who for many years occupied a foremost place in the heating and ventilating world, it has been suggested that it would be fitting to provide a memorial to his memory in Sibley College, Cornell University. One suggestion is that a stone seat or a drinking fountain, with suitable inscription, be placed in front of the college. Another suggestion is an old portrait or a bronze tablet.

A third suggestion is that in the new mechanical laboratory which is to be built and equipped in the near future, the portion devoted to research should be called the R. C. Carpenter Laboratory of Research.

CORRESPONDENCE

Sizing Indirect Radiator in Recirculating System.

EDITOR HEATING AND VENTILATING MAGAZINE:

We have a room 18 ft. long, 15 ft. wide and 8 ft. 6 in. high. The room is exposed on the south side (18 ft. x 8 ft. 6 in.) and on the west side (15 ft. x 8 ft. 6 in.). The wall exposed on the west side contains two windows each 3 ft. x 6 ft. The room also has a fireplace.

What size stack would be required if we decided to heat this room by a recirculating indirect radiator. I. B.

New York.

The following calculations are offered for the solution of this problem: As the construction is unknown a constant of 0.3 is assumed. The heat loss would then be 18 ft. x 8.5 ft. x 0.3 x 70 = 3213 B. T. U.

(2 x 3 ft. x 6 ft. x 1.09) + [(15 ft. x 8.5 ft.) — 36 sq. ft. of glass) x 0.3] x 70° + 10% = 5135 B. T. U.

3213 + 5135 = 8,348 total B.T.U. required for heat losses.

Entering air is assumed at 120° temperature (for steam in radiator) and 55 cu. ft. of air heated 1° by 1 B. T. U.

(8,348 x 5) ÷ (120 — 70) = 9,183 cu. ft. of air to be supplied to offset heat losses. This also gives four air changes per hour for ventilation.

As certain factors are not stated in the correspondent's question, it should be kept clearly in mind that the efficiency of the heating surfaces is dependent upon their arrangement and free area, height of heated column above, and temperature (steam or water).

Other factors that would have to be considered are the height and size of fireplace flue, first or second floor room, average temperature of the air passing over the heating surface and velocity of flow over same. Further, if fireplace is in use for heating, it would result in increased flow, due to action of its flue

(70 + 120) ÷ 2 = 95° average temperature. 227° steam — 95° x *1.82 = 240 B.T.U. efficiency.

*Usual velocity of air over heating surfaces to first-floor rooms is 200 ft. per minute and the constant for this is 1.02.

8,348 — 240 = 35 sq. ft. of steam heating surface required when recirculating.

An open fireplace, when in use, may increase the ventilation as much as ten times, so that unless provided with a damper, recirculation would probably be impossible. If the fireplace is open, the amount of heating surface must be increased for the given air volume heated from zero to 70° and then lost up the fireplace.

Ventilation and Waste Piping in Chemical Laboratories.

EDITOR HEATING AND VENTILATING MAGAZINE:

Will you kindly give what information you have on file regarding the kind of piping that has proved to be most satisfactory for the installation of waste piping in chemical laboratories. The ordinary waste from chemical laboratories is of a dilute acid nature and is very corrosive on the ordinary kind of piping that is used for this purpose. Can you give me any information or direct me to where I can get the same on what has proved to be the most satisfactory piping material for this class of waste?

Minneapolis, Minn. R. W. O.

EDITOR HEATING AND VENTILATING MAGAZINE:

We would like to know if there are any special requirements for the ventilation of chemical laboratories in school buildings.

New York. A. F. T.

Lead-lined pipe and lead-lined drainage fittings are probably as servicable as anything that can be used for draining waste from chemical laboratories. The use of this may also be extended to the acid vent stacks, although extra-heavy cast-iron is ordinarily sufficient for the purpose. Lead-lined pipe and fittings are manufactured by the Lead Lined Iron Pipe Co., of Wakefield, Mass. The piping is made of wrought-iron, with a concentric lead lining applied to the inner surface by a process which causes the lead to engage with the iron at every point. The fittings are similarly treated and recessed with the lead lining carried over the recess and down into the female thread in such a way as to prevent the exposure of any iron surface on the interior of the pipe or fitting after being made up. All such pipe should be cut with a hack-saw and coated with asphaltum on the outside.

Another method is to use vitrified tile No 20 gauge galvanized sheet-iron casing, and run with hot tar. The drain for its entire length should be enclosed within a No. 20 gauge galvanized sheet-iron casings, with overlapping joints and 6 in. larger in diameter than the tile pipe. The annular space between the outside of the tile pipe and the inside of the casing should be made concentric and then carefully filled with concrete, well tamped. The drain should be well supported at each floor by special heavy wrought-iron supports securely fastened to the steel beams.

It is sometimes difficult to secure large-size running traps, with lining of lead. In such cases, if well supported and protected and the local plumbing code is favorable, tile running traps could be used.

The Threatened Coal Shortage.

Flaming broadsides in the newspapers urging early coal buying in anticipation of a shortage next winter, coming on top of a statement on the subject issued by the chairman of the National Coal Association's special committee dealing with the prospective shortage, has caused something of a furore in the industrial world. According to the statement issued. Government coal production figures point to "the greatest coal shortage in history" next winter, unless production is stimulated immediately 25% or more throughout the nation.

"The information gathered by the committee," states the chairman, F. S. Peabody, "is that at the present rate of production one industrial plant out of every eight in the United States will have to shut down next winter for lack of coal."

The bituminous coal shortage of 65,000,000 tons for the first twenty-four weeks of 1919 must be wiped out and production increased 30% the remainder of the year to meet the nation's requirements of 530,000,000 tons, according to the statement.

New Publications.

A Critical Review of Methods for the Study of Dust Content of Air, by Henry Field Smyth, acting director of the Laboratory of Hygiene, Medical School University of Pennsylvania, is the title of an article appearing in the July number of the *Journal of Industrial Hygiene*, published by the Macmillan Co., New York.

MODERN PRACTICE IN VAPOR HEATING

EDITOR'S NOTE: *For the purpose of this series of articles, a vapor, vacuum, vapor-vacuum, vacuum-vapor, atmospheric, modulated or thermograde system of heating will be considered as any system in which the steam pressure ordinarily carried is practically at atmosphere or slightly below or in which the returns are open to the atmosphere and where no pump or other positive mechanical device is employed to pull back the returns.*

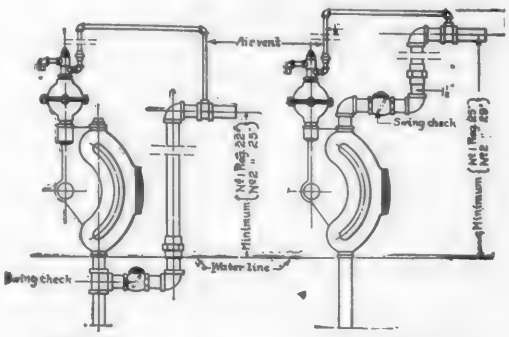
XIII—THE SIMPLEX SYSTEM.

The distinguishing feature of the Simplex system is the use of the Wiley "safety-vent" vapor regulator, for regulating the boiler draft and controlling the vent outlet. Regulation and control are accomplished in a way that prevents damage to the boiler through the discharge of water through the vent opening in case of an accidental rise in pressure beyond the ordinary safe limits.

With this equipment boilers are fitted with regular low-pressure safety valves, as for ordinary steam heating work. If the pressure should rise through careless handling, the heat ordinarily lost through special low-pressure safety valves is stored up in the form of pressure and is given out again as the fire dies down and the pressure is lowered to the normal working range. The loss of water, in the form of vapor, through special low-pressure safety valves usually employed in vapor heating systems, is also prevented. Considerable stress is laid on this point by the manufacturers, as it is well-known that the discharge of steam through a safety valve at a few ounces pressure often lowers the water in the boilers to the danger point.

Other features of the Simplex system are the Wiley calibrating radiator valves and water-seal traps.

As these are all the specialties used with the system special importance attaches to the "safety-vent" vapor regulator. This device consists of a semi-circular cast-iron float chamber, with outlets at top and bottom for connecting into the vertical return pipe at one side of the boiler, as shown in Fig. 1. The casing is also threaded to receive the bronze float stem bonnet and stuffing box, as well as the bronze vent valve casing at the top.



Type B. Type A.

FIG. 2—METHODS OF CONNECTING SIMPLEX REGULATOR.

Type B for air return mains over 2½ in. or those limited to less than 25 in. above water line. Type A standard connection up to 2½ in. air return main, with 25 in. or more elevation above water line.

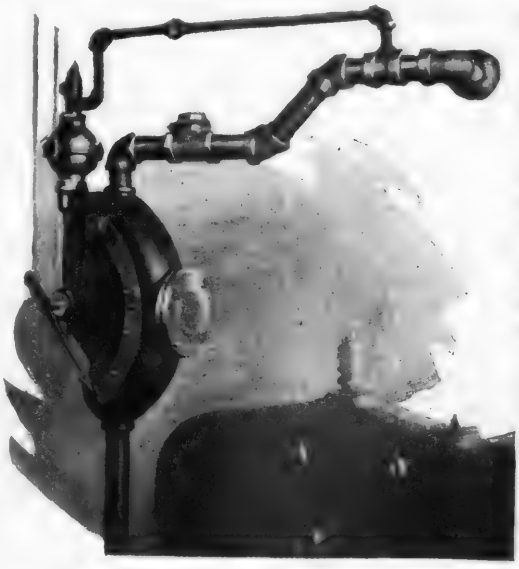


FIG. 1—SIMPLEX REGULATOR, WITH TYPE A RETURN PIPE CONNECTION.

Inside of the float chamber is a copper float attached to a float arm carried by a float spindle extending through the bonnet and stuffing box. The float spindle carries a combination pointer and damper-operating lever. It will be noticed that this lever has a series of holes in it, so that it can be adjusted for any desired movement of the dampers.

The safety-vent regulator is equipped with an independent float-actuated safety-vent valve through which the air is discharged from the heating system It is mounted, with its spherical float chamber, directly on top of the regulator casing.

The float is designed to positively close the valve outlet in case of any accidental rise in pressure. Care should be taken to place the regulator above the water-line in the boiler.

In operation the air and condensation from the heating system passes through the float chamber on its way to the boiler, the air passing out through the vent valve on top of the casing while the water descends to the boiler by gravity.

The generation of steam in the boiler

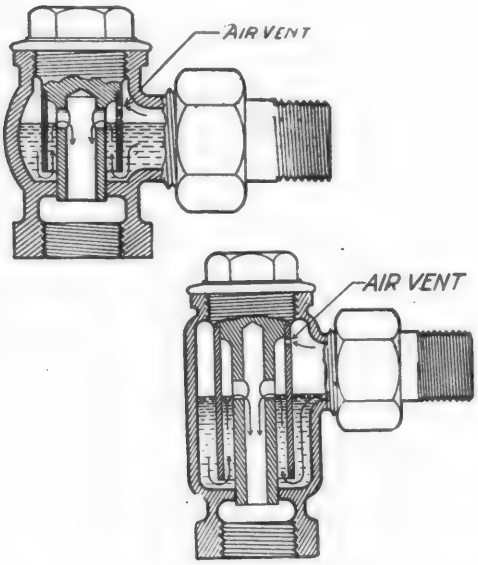


FIG. 3—WATER SEAL RADIATOR TRAPS USED WITH SIMPLEX SYSTEM.

Type A used when radiator connections are taken off above floors.

produces a downward pressure on the surface of the water, forcing it up into the float chamber. This action carries the float upward and also moves the damper operating lever and pointer, incidentally indicating the pressure in ounces on the graduated scale on the side of the float chamber, while operating the dampers by means of flexible cables.

The manipulation of the dampers retards the rate of combustion and controls the generation of steam, so as to hold it within the desired operating range of a few ounces.

In addition to the provision in the safety-vent valve for the closing of the vent opening in case of an accidental rise in pressure and consequent elevation of water beyond the range of the float chamber, the return line is provided with a swing check valve located just above the regulator, to prevent the water from being forced into the return line during such rise in pressure. It will be noticed that the check valve is provided with a by-pass pipe connected into the safety-vent valve. This is to provide for a free passage for the outgoing air during the normal operation of the apparatus, without overcoming the resistance of the check valve in the return line.

The construction of the water-seal vapor traps and of the Wiley calibrating radiator valves may be seeen from Fig. 3. The radiator valves are sent out with adjusting spindles screwed down to the finest adjustment suitable for radiators up to 15 sq. ft. For larger radiators adjustments are made by turning the spindles to the left. One complete turn to left adapts the valve for a 15 to 20 sq. ft. radiator, and so on, running up to 100 to 150 sq. ft. radiator, which takes seven complete turns to the left. This applies for pressure up to 6 oz.

SPECIFICATION DATA.

The directions and specification data issued by the company, offer some good suggestions. The boiler, of course, should have a steam rating from 25% to 30% greater than the total net vapor radiation to be served. For ordinary residence work, boiler-rooms should have a pitch of about 8 ft. in the clear below the floor joists, measuring from the bottom of girders or beams. Some boilers with low water-lines can be installed in small residences with less than 8 ft. in many cases but the importance of good head room under the pipes, as well as a good working margin for the return of the condensation, is well emphasized.

As has been brought out in previous articles in this series, the terminals of the steam mains and the return lines coming back to the boiler must have an elevation of not less than 30 in. above the water-line in residences and small buildings, and 36 in. to 48 in. in larger buildings.

The company's recommendations for flue sizes are 7 in. x 11. in. inside for small residences, and 11 in. x 11 in. inside for average residences up to 1500 sq. ft. of radiation, based on a height of about 40 ft. For larger buildings the flues should have an area of not less than 112 sq. in. for each 1,000 sq. ft. of radiation, based on a height of 40 ft. and the sizes can be reduced about 6% for each additional 10 ft. in height up to 100 ft.

Under "radiators," the suggestions are that they be of the water type, connected both top and bottom and tapped for steam valves at top and returns at bottom on

opposite ends, all steam tappings to be ¾-in.

The steam mains and supply risers in small or moderate-sized plants should have an area of not less than 0.78 sq. in. for each 100 sq. ft. of radiation supplied, and mains should have a grade of not less than ½-in. in 10 ft. in the direction that steam flows. The sizes of mains, of course, can be reduced in large plants with comparative short runs and the risers can be reduced in the larger sizes under average conditions.

It is recommended that return mains should not be less than 1 in. in diameter at any point and should gradually be increased to 1½ in. for plants up to 1,500 sq. ft. of radiation, 2 in. for plants from 1,500 to 2,500 sq. ft., 2½ in. for plants from 2,500 to 3,500 sq. ft., etc.

For the top-floor radiators, ¾-in. steam risers are recommended for radiators under 40 sq. ft., 1 in. for radiators from 40 to 100 sq. ft., and 1¼ in. for single radiators above this size; riser connections with mains to be one size larger than risers. All horizontal steam connection from risers or mains to radiators should be ¾ in. up to 60 sq. ft., 1 in. from 60 to 100 sq. ft. and 1¼ in. above this size. All vertical steam connections for radiators up to 150 sq. ft. should be ¾ in. from floors up to radiator valves.

Return connections should be ½ in. from traps through the floors and ¾ in. horizontal back to risers or return mains, for radiators up to 150 sq. ft. All return risers should be ¾ in. up to 300 sq. ft. of radiation and 1 in. above this amount.

The simplex system is manufactured by the Simplex Heating Specialty Co., Lynchburg, Va.

National Sheet Metal Contractors' Association.

The following officers were elected at the recent annual meeting of the Sheet Metal Contractors' National Association: President, Arthur P. Lamneck, Columbus, O.; vice-presidents, Frank B. Higgins, St. Louis, Mo., John A. Pierpont, Washington, D. C., George P. Werner, Galveston, Tex., and D. M. Haines, Chicago, Ill.; secretary, E. L. Seabrook, Philadelphia, Pa.; treasurer, Julius Gerock, St. Louis, Mo.

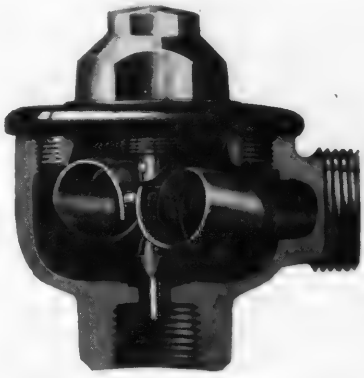
Peoria was selected for the 1920 convention.

NEW DEVICES

New Ideas Embodied in a Radiator Trap.

In the design of a radiator trap, whether the thermo element be a diaphragm containing a volatile liquid or whether of metallic construction, the element must in all cases perform work. In one case this is effected through a temperature change applied to a mass of liquid and, in the other, to a mass of metal.

In the design of the Trane Thermetal trap, which has recently beeen placed on the market by the Trane Co., La Crosse, Wis., after the type itself had been determined, it was only necessary to decide the amount of work that must be performed within certain temperature limits and then select the proper amount of metal arranged



CONSTRUCTION OF TRANE THERMETAL TRAP.

in a particular shape which would do this work. The ordinary limitations which are required of traps are, on the average, for operation with 10 lbs. pressure on one side and a maximum of about 10 in. of vacuum on the other, amounting to a total difference in pressure of about 15 lbs. At these extreme limits the operation of a themostatic trap would be considered ideal or perfect if the water of condensation were allowed to run out of the radiator at a temperature of approximately 190° F.

In the case of the Trane Thermetal trap it was decided to base the design at a pressure differential of 25 lbs. on the supply and 10 in. of vacuum on the return, making a total difference in pressure of 30 lbs. and at the same time to allow the water of condensation to run from the trap

at 190°. The temperature of steam at 10 lbs. pressure being 240° and at 10 in. of vacuum, 190° gives 50° temperature difference, which, multiplied by the mass of the metal in the Trane Thermetal trap, was found to create sufficient force to operate the valve mechanism on the standard trap which is furnished for all ordinary conditions. It is pointed out that, of course, a member designed for these maximum conditions will operate under less extreme conditions or under ordinary conditions of, say, 5 lbs. steam pressure and 10 in. vacuum very readily, and only a small portion of the work that the member can do is actually utilized.

The development of the member used in the Trane Thermetal trap is unique because of the circular construction of the two parts. Through this construction, it is explained, an unusual expansion per degree difference has been achieved. Not only this, but a straight-line motion has been obtained which makes the Trane thermo member adaptable to the accepted design of thermostatic traps.

Another point given emphasis is that the Trane thermostatic member is affected only by temperature. Pressure in no way affects it and consequently it is a simple matter to design traps for various differences in pressures of steam. Atmospheric change is the operative force and the pressure difference required on the two sides of the valve is the calculation for the amount of work that must be done The metals used are a non-corrosive steel on the outside and brass on the inside. The two metals blend from one to the other in a distinct line, so that there is no possibility of separation or deterioration due to age or corrosion; both metals are non-corrosive.

Exhaustive tests made in the Trane factory, together with other tests made by heating engineers, it is stated, have proven that the Trane trap will not allow steam to pass into the returns, that the radiation will heat up better than 99% perfect and, in vacuum heating work, will operate with practically no re-evaporation.

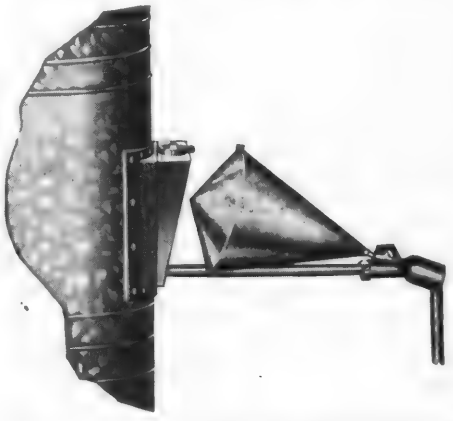
Endorses Law to Permit Fixing of Resale Prices.

The Federal Trade Commission, in a special report to Congress, has renewed its recommendation, made last December, that manufacturers be permitted by law to fix and maintain resale prices, subject to review by a disinterested party.

Trade Literature.

HORNUNG PRESSURE AND TEMPERATURE CONTROL for steam heating, featuring the line of central heating appliances of J. C. Hornung, Chicago, Ill., are brought to the attention of the trade in a new catalogue. The Hornung pressure and temperature control valves are given first place, being followed by the Hornung magnetic valve for use as a pilot valve in connection with the "P & T" control valve when the electric type of temperature control is selected, low voltage transformer, thermostats, hot water convertors, storage heaters, the Hornung magnetic regulator, the Hornung water seal for vapor or atmospheric systems of heating and other specialties. Pressure and temperature control in one valve, it is stated, means that with one master control valve the entire building may be completely warmed without waste. No matter what the pressure may be in the street mains, the "P & T" valve will give the correct pressure to each consumer. The central heating plant also cannot shut off the heat from a building when it is getting too warm, but the temperature control part of the master control is designed to do this automatically by closing the valve entirely and keeping it closed as long as the buiding is warm enough. Size 6 x 9 in. Pp. 12.

HAYNES AUTOMATIC VALVE for use in connection with the Haynes humidifier for air heaters is an interesting device described and illustrated in new circular matter issued by the Haynes Regulator Co., 2429 Independence Ave., Kansas City, Mo. The arrangement of the humidifier and valve is shown in the accompanying illustration. The valve does not depend upon a float for its action. There is a small water weight tank on one



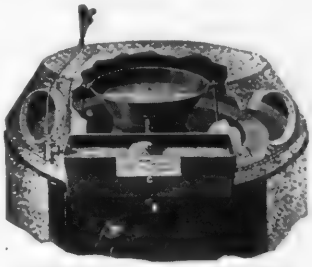
HAYNES AUTOMATIC VALVE CONNECTED TO WATER PAN OF WARM AIR FURNACE.

end of a rocker arm and a cast-iron weight on the other end. As the water in the water-pan rises, it backs up in a small cone-shaped tank and this tank, becoming heavier than the weight shuts down and closes off the water. The port between the valve tank and the water pan is always open. Thus, when the water evaporates from the pan, it flows out of the water weight tank, maintaining its level. The tank, becoming lighter than the weight, rises and allows the water to flow in from the city main. During the summer months the valve and water-pan may be drained by loosening the lid of the valve body, while the water may be permanently turned off by removing the weight from the valve arm. If the washer gives out, it is unnecessary to disconnect the water pipes, as the washer may be renewed by removing two screws which hold a small lid in place. The valve is listed at $7.00, and the complete humidifier at $20.00.

SPRAGUE ELECTRIC PORTABLE OZONATORS are the subject of new circular matter issued by the Sprague Electric Works of General Electric Co., New York. The household type ozonator is taken up at length and its construction explained in detail, with illustrations. Heat and moisture, it is stated, may be readily controlled by regulation of heating and ventilation, but the proper treatment of objectionable odors, a matter of no less importance, requires other means. The universal type ozonator is especially designed for large ventilating installations. The ozone which is produced in carefully-calculated quantities, is immediately introduced into the ventilating air for distribution in the building.

SI-FO VENTILATOR, which is of the rotary type, with the siphonic feature, has recently been brought out by the Kain & Aunger Co., 1364-68 East 34th St., Cleveland, O., and is the subject of newly-issued circular matter. As the wind strikes the cylindrical cone of this ventilator it is deflected outwardly to the larger or front end of the funnel. As the funnel tapers around the inner chamber, the outlet is contracted, causing the air to leave at a greater velocity than that at which it entered. This produces siphonic action at the open end of the inner chamber and naturally exhausts air from the vertical chamber. To further increase the velocity of the air for obtaining greater siphonic action, a number of openings are provided in the walls of the inner chamber, covered by inclined pockets having open front ends and closed rear ends. The circular contains the report of a test made by F. H. Vose, professor of mechanical engineering at the Case School of Applied Science, in Cleveland, in which an air velocity through the ventilator was obtained of 592.5 ft. per minute, with a wind velocity of 4.28 miles per hour. As the ventilator was 12 in. in diameter, this gave 4.12 cu. ft. of air per minute per square inch of area. The outdoor temperature was 41° F. and that of the air entering the ventilator, 78° F. The distance from the roof to the lowest point of the exhaust opening was 5 ft. 10 in.

MOORE'S ALL-CAST-IRON MOISTURE GENERATOR, for use in connection with the Moore warm-air furnace, is an interesting appliance, brought out by Moore Bros. Co., Joliet, Ill., and featured in recent circular matter. As will be seen from the accompanying illustration, the device is equipped with an evaporating pan which rests on the dome of the furnace. It is connected



MOORE'S ALL-CAST-IRON MOISTURE GENERATOR.

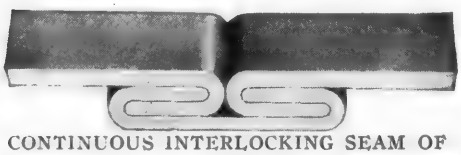
by means of a supply pipe with a tank on the outside of the furnace, this tank being automatically supplied with water from the general house supply. A sliding regulator under the moisture pan permits the entire bottom of the pan to be wholly or partially subjected to the furnace heat. This makes it possible to control the amount of moisture given off by the generator.

CABCO GAS STEAM RADIATORS, made by the Cabco Iron Works, Gowanda, N. Y., are presented in a new catalogue. This radiator is made up of a series of standard cast-iron radiator sections. It has an automatic thermostatic valve and an air mixer. A Bunsen type burner is used, with an automatice air valve and an automatic safety valve. The radiator has a water-filling plug but requires no water connection. In starting the radiator, from 4 to 10 quarts of water are poured in the water-filling plug and the gas turned on and lighted. The water, it is stated, will last two weeks without being replenished. Steam is generated in from 20 to 30 minutes' time. As soon as 6 lbs. of steam pressure is obtained, the thermostatic

valve automatically turns down the gas to the amount necessary to maintain this steam pressure. Cabco gas steam radiators are made in various sizes running from 3-col. 24-in. to 3-col. 42-in.

LIBERTY DRAFT CONTROLLER, designed for any kind of heating system, and described as capable of automatically holding down the draft to just where it should be, has been brought out by Moline Heat, Moline, Ill., and is shown in newly-issued circular matter. In the first place, it is stated, their draft controller is large enough to do the work. Also the peculiar shape makes it possible for the door to open freely without restricting the air flow or causing eddies in the air as it passes up the chimney. Furthermore, the two weights and their arrangement provide balance and counter balance, the upper weight just balancing the weight of the door, and the lower weight being set to balance with the draft required through the fire pot of the furnace. In other words, the controller has a counter-balanced door which the increased draft ni the chimney opens just far enough to admit more air The draft in the boiler, it is pointed out, does not increase. As the chimney cools or the wind lessens, the door partially closes and when the weather becomes normal again the door returns to the position at which it was set. The controller door moves with every change of draft pull.

STANDARD REINFORCED SPIRAL PIPE, described as having a continuous interlocking seam, with no rivets and smooth inside, is a product of the Standard Spiral Pipe Works, Chicago, Ill., discussed in a new catalogue issued by this company. Special attention is called to the continuous interlocking seam. A soft open-hearth



CONTINUOUS INTERLOCKING SEAM OF STANDARD REINFORCED SPIRAL PIPE.

steel is used which will stand the required bending and in winding the steel into the spiral form advantage is taken of the tensile strength and stiffness of the material to make the pipe especially strong. Its lightness is also mentioned as making it convenient for easy moving and installation in places difficult of access. No rivets are used in its manufacture and all flanges are attached by the welding process. It is described as especially adapted for hydraulic lines, including exhaust steam mains, powdered coal distribution, brine circulation, smoke stacks, and compressed air lines. Several pages of the catalogue are given over to photographs of typical

STEEL FLANGES WELDED ON SPIRAL PIPE.

installations. One page contains drawings of sheet-metal special fittings used in connection with the pipe, while other pages show styles of joints used, followed by complete list prices. Size 8 x 10½ in. Pp. 40.

Foreign Building Information.

Through its Reconstruction Research Division, the United States Council of National Defense has prepared for distribution the latest data available regarding foreign reconstruction and readjustment activities. A few of the headings, taken at random, include the activities of the Belgium reconstruction committee in Paris, and the construction of public works throughout the world. The edition, which is limited, is being placed in the public libraries, and in the hands of the member organizations of the United States Chamber of Commerce The trade journals are also each receiving a copy.

False statements derogatory of its competitors and misleading to the public are alleged in a formal complaint of unfair competition issued by the Federal Trade Commission against the North American Construction Company, Bay City, Mich., manufacturers of "Alladin Readi-Cut Houses."

Among the statements in effect complained of are: that purchasers of lumber and building materials from the Aladdin company may effect a full saving of from 35% to 45% of the cost; that local retail lumber dealers add $300 to a $700 bill for lumber; and that lumber purchased from the Aladdin company is "direct from forest to home."

The concern was cited to make answer before the commission in Washington, August 11.

A war-invention

Hot Water Heat for small cellarless buildings and factory and community group houses

The IDEAL ARCOLA offers a quick, sure method of turning any old house into a cheery, modern *home.* The AMERICAN Radiators and their simple piping can be set in the rooms at convenience, and then when ready, the parlor stove is dismantled and the IDEAL ARCOLA Boiler is quickly set in its place and connected.

The IDEAL ARCOLA Radiator-Boiler provides Hot Water Heat for cellarless bungalows, small city and farm cottages, one story stores and office buildings, small school-houses, resort-cottages, small churches and chapels, garages, interurban car and railroad stations, weighing rooms, village fire and police stations, etc.

IDEAL ARCOLA Radiator Boiler

Send at once for informative book showing typical installations and giving range of sizes and details of construction

AMERICAN RADIATOR COMPANY

Sales branches and showrooms in all the large cities

ONE-PIPE STEAM SYSTEMS.

Radiator Connections.

Table I.

Size of Pipe, Diam. Inches.	Square Feet of Radiation. (E. D. R.)
1	24 or less
1¼	24 to 60
1½	60 to 80
2	80 to 130

Table II.

Fitting.	1-in.	1¼-in.	1-½-in.	2-in.	3-in.	4-in.	5-in.	6-in.	8-in.	10-in.
	Lineal Feet of Additional Length to be Added to Main									
90° Ell	3	4	5	7	10	13	17	20	27	33
Globe Valve	7	8	10	13	20	27	33	40	53	67
Entrance	5	6	8	10	15	20	25	30	40	50

Table III.

Radiation. Sq. Ft.	Main Size, Diam. Inches.	Runout and Riser, Diam. Inches.	Radiator Connections Diam. Inches.
24	1	1¼	1
60	1¼	1¼	1¼
125	1½	2	1½
250	2	2½	2
600	2½	3	..
800	3	4	..
1600	4	5	..
2300	5	..	..
4100	6	..	..
9600	8	..	..

Radiator connections should be not less than the sizes shown in Table I.

All horizontal branches over 5 ft. long should be one pipe size larger than the riser to which they connect. This is due to the flow of condensation through the horizontal pipe being retarded.

While it has been previously stated in this article that 25% is allowed as added to the actual length of the main to obtain an equivalent length for the fittings, sometimes the friction may increase 100% and when more accurate results are desired, the fittings, valves, etc., can be counted and the actual equivalent length computed. For this purpose the friction of each fitting and valve must be assumed as equivalent to an added length of run as shown in Table II.

A method which can easily be memorized is to allow 60 pipe diameters for the "entrance," each globe valve and each tee, where the steam passes through the branch, and 40 pipe diameters for each 90 ell; tees passed through on the run and gate valves may be neglected. The "entrance" friction is the friction occurring when the steam enters the pipe.

For small residence systems Table III previously published in THE HEATING AND VENTILATING MAGAZINE for April, 1908, will serve as a very complete schedule.

VACUUM HEATING SYSTEMS.

General.

The vacuum system of heating was primarily designed with the idea of reducing the back pressure on engines where the exhaust is used for heating, but the advantages soon became so manifest that vacuum systems were speedily adopted for all sorts of work, regardless of the fact whether the steam is supplied by an engine exhaust or from some other entirely unrelated source.

On the average vacuum systems of today very little vacuum exists except in the return line and (while it is possible for this vacuum to extend into the radiators when the steam is partially throttled down at the supply valve) the vacuum itself seldom, if ever, extends as far as the steam line. Indeed, many vacuum systems are supplied with steam through a reducing valve which keeps 5 lbs. or more steam pressure on the supply line at any and all times.

Therefore, a vacuum system may be defined as a steam heating system in which the radiator connection to the return line is trapped and where the air and water pass through the trap into the reurn line from which both are removed by the suction of a positive-acting piston pump.

The chief thing to be remembered in designing vacuum systems is that there must be no direct connection between the steam and return main either through drips, radiators or water seals; all connections between the two mains must have a trap interposed to prevent the inrush of steam into the return line.

Vacuum systems will operate with bottom connections and even with steam radiators, but the best results are attained when top-inlet water radiators are used in conjunction with graduated supply valves, as this allows a partial or graduated heating of the radiator *horizontally* instead of concentrating the heat in a few end sections, as otherwise results.

The quality of radiation is not affected by use of a vacuum system over that required for gravity work (since the steam pressures are identical) and the radiation may be determined as explained in Standard Data Sheet No. 13. The chief advantage of the vacuum system over the gravity system, besides the graduation of the heat control, lies in the quickness with which the returns are sucked back by the vacuum pump and the corresponding reduction in pipe sizes on the return lines; air valves on the radiators are also eliminated.

The amount and type of radiation having been fixed upon the next factors to be considered consist of the sizes and arrangement of the pipe lines.

VACUUM HEATING SYSTEMS.

Pipe Sizing.

The sizing of the piping for a system of vacuum heating is not at all difficult when the tables included in Standard Data Sheets 128-A, B, C, etc. are used. The two factors to be decided upon consist of the length of run from the source of steam supply to the farthest and most remote radiator, counting in all vertical as well as all horizontal travel; this gives the lineal distance the steam will have to flow in the worst case. The drop is usually taken so as to leave the steam with not less than 1 lb. pressure at the farthest radiator (but is seldom figured as over 2 lbs. total) and as the drop shown in the tables is for straight pipe *only* it is customary to allow 100% increase for fittings, since many mains contain enough fittings to almost double the friction obtained in the straight pipe.

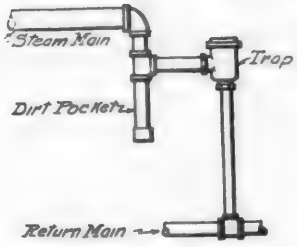
Thus, if 3 lbs. pressure of seam is generated and the farthest radiator must have 1 lb. at the radiator then the allowable drop is $3 - 1 = 2$ lbs. Since the fittings absorb half the drop and the straight pipe the other half, each will cause a drop of 2/2 or 1 lb. And if the longest run is, say, 375 ft. the table for "Capacities of Steam Mains — 1 lb. drop and 400 ft. E. D. R." on Data Sheet 128-D would be used to size the steam lines.

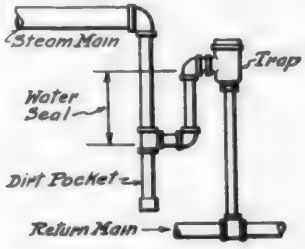
For the return lines custom follows the [illegible] given in the table on Data Sheet 128-F for 15% steam, [illegible]ough the author of the table claims that 2½% steam on the mains, and 7½% on the branches would be sufficient. Owing to sediment, rust, etc. it is generally considered better practice to use the 15% capacities.

VACUUM HEATING SYSTEMS.

Piping Details.

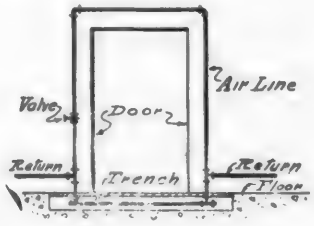
Fig 1





Fig

Fig 3



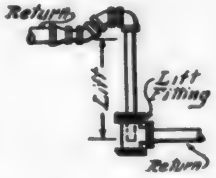


Fig 4

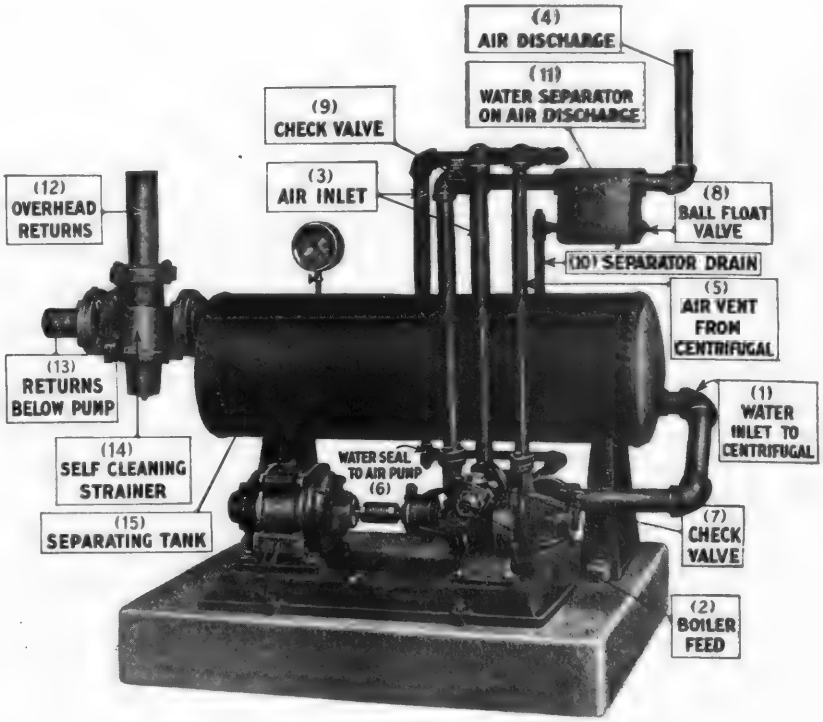
Having the proper schedules for sizing the lines the next thing is to arrange the lines properly. The steam main should slope down in the direction of flow with a drip on the end so as to allow the water and air (but not the steam) to pass off into the return line. Such main drips are usually connected up as shown in Fig. 1, with a scale pocket in front of the trap to prevent foreign particles finding lodgment in the trap. If the trap is one operating on the thermostatic principle it must be protected from the direct action of the steam and slugs of water (which sometimes shoot down the main)by a water seal, as shown in Fig. 2.

Where it is necessary to pass the return line under a door, an air loop may be run over the top of the door at the same time so the return main can be brought back to the same level on the other side. This is illustrated in Fig. 3, the water passing through the lower pipe and the air up and over the loop, both uniting again beyond the door without placing any additional load upon the pump.

If it is required to lift the return (a thing to be avoided if possible) a rise of moderate amount—say 4 or 5 ft.—may be accomplished without much difficulty. This raise may be all in at one point or may be divided into as many steps as desirable as long as the total lift does not exceed the allowable limits. In order to lift the return a special arrangement called a lift fitting is necessary, this being shown in Fig. 4 and described as follows:

A common flanged tee two sizes larger than the main return pipe is attached to the end of the return at the point of lift; into the top of this tee is screwed a pipe one size smaller than the main return, the end of this pipe being run down to a point ¼-in. below the level of the invert of the return. This results in the suction pulling up the water in preference to the air and in the sucking in of globules of air so that the water and air are intermixed. At the top the riser is carried slightly above the level of the higher main and is then turned over and connected into the higher main through two 45° ells, as shown; this prevents the slugs of water falling back down the vertical leg. The main is then increased to its former size and runs along from the new elevation the same as before.

Efficient Heating
demands the JENNINGS PUMP



Size C for 26,000 square feet radiation, requiring only 2 H. P. Motor at 1,720 R. P. M., when delivering from a vacuum 10 inches mercury against a boiler pressure of 10 lbs.

The Jennings Pump consists of two independent turbine units, an air pump and a water pump, combined in one casing, with the impeller of each mounted on the same shaft.

One unit continuously exhausts air and vapors from the heating system, and the other removes the condensation as it accumulates and forces it directly into the boiler, or up to the hot-well.

The boiler pressure is against the water only. The air and vapor, representing approximately four-fifths of the volume handled, are delivered to the atmosphere *without back pressure. The saving in horse power amounts to over 50 per cent.*

The Pump is bronze fitted throughout. The shaft is tobin bronze. The air rotor, water impeller, lobe, port plate, sealing rings and clamping nuts are bronze. The shaft is supported on high grade annular ball bearings mounted outside of the pump casing.

Write for Bulletin No. 8

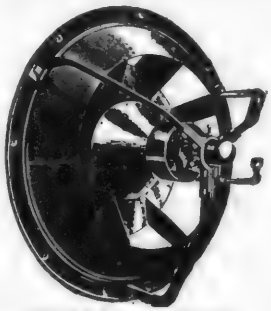
NASH ENGINEERING CO.

SO. NORWALK, CONN., U. S. A.

TRADE AND MISCELLANEOUS NOTES

Miscellaneous Notes.

Chicago, Ill.—A question has arisen as to the rights of some of the beneficiaries of the will of the late John B. Pierce, formerly vice-president of the American Radiator Company, due to the fact that they entered the service of the country during the recent war. The will provided that the beneficiaries should be those who had remained in the active service of the company. The matter is now before Judge Dow of the Essex County Probate Court for decision, on a petition of Clarence M. Woolley et als., executors of the will of Mr Pierce. The petition states that the will should be considered in its entirety in constructing the clauses called in question, that the beneficiaries entered the service of the country with the knowledge that the responsible heads of the company considered that such action would be not only for the interest of the United States and all its ideals, but would be the most important thing they could do for the benefit of the American Radiator Company; that it was the expression and well-known attitude of the responsible officers and executive committee and therefore of the corporation that any entrance into military service would be to exert their energies and employment of their efforts in the most effective way for the welfare of the American Radiator Co. and the continuance of its prosperity by winning the war; that the respondents and each of them entered the military service under an implied agreement that it would not affect their standing as employees of the company and with the full intent and purpose of remaining to all intent and purpose in the active employment of the American Radiator Co. and not entering the employ of any other person, firm or corporation and with the intent and purpose of continuing such service only temporarily and then returning to their positions and that the responsible officers



DUPLEX CONE FAN
Belt Driven

HOWARD & MORSE
45 FULTON ST., N. Y.
Ventilating Engineers and Contractors
MANUFACTURERS OF
BLACKMAN and DUPLEX CONE FANS
which are installed by us complete with Motors, Duct Work and Wiring.

Aligning, Rigging and Hoisting done, with labor thoroughly qualified from long experience.

We make a specialty of Kitchen Exhaust work. Prominent buildings, hospitals, theatres, and private residences are among our many and recent installations

The Duplex Cone Fans are semi-conoidal fans, made especially to operate against pressure in duct systems.

The Blackman Fans are used for fresh air delivery and in duct systems, when no great pressure is involved.

You can have the advantage of our experience.

SEND FOR CATALOGUE

BLACKMAN FAN
Direct Connected to Motor

Please mention THE HEATING AND VENTILATING MAGAZINE *when you write.*

and executive committee of the company had expressed the sentiment that this service should not be considered any break in their active employment and in fact every employee has been continued in the employment, being given his former position or one equally advantageous; and that they are fully entitled to share under the will as beneficiaries under class D of employees.

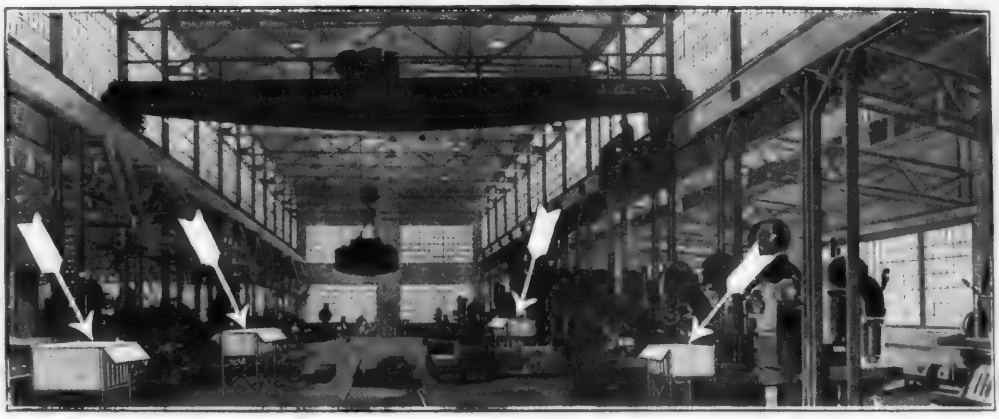
Building Operations for June, 1919, make the best showing of any month this year, indicating a gain of 182% over the corresponding figures for June, last year. The reports for 158 cities, compiled by the *American Contractor*, total $134,726,715, as compared with $47,793,182 for June, 1919. The increase was general in all parts of the country. In Chicago the gain was from $4,062,500 to $11,415,600; in Detroit, from $3,012,975 to $6,649,045; New York, from $5,181,102 to $28,705,569. In Manhattan alone the gain was from $2,253,689 to $13,448,881 Philadelphia jumped from $1,671,900 to $7,354,625; and St. Louis, from $891,863 to $2,016,711.

Chicago, Ill.—Based on the argument that the combination dining room, kitchen and sleeping apartment is a detriment to the health of the community because of

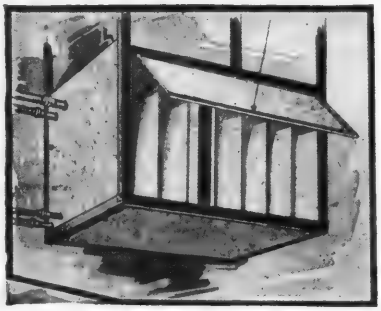
ILGAIR UNIT HEATERS

ARE CREATING A

BROADER MARKET



Floor Type Installed in Modern Manufacturing Plant



Ceiling Suspension Type

For large open spaces—where the initial and maintenance costs of both direct radiation and blast systems are often objectionable—you will find Ilgair Unit Heater a correct and economical solution.

Remarkably low power consumption, extremely low amount of radiation.

Circular describing details mailed upon request.

HIGH EFFICIENCY TRADE ILG MARK VENTILATING MACHINERY

ILG ELECTRIC VENTILATING CO.

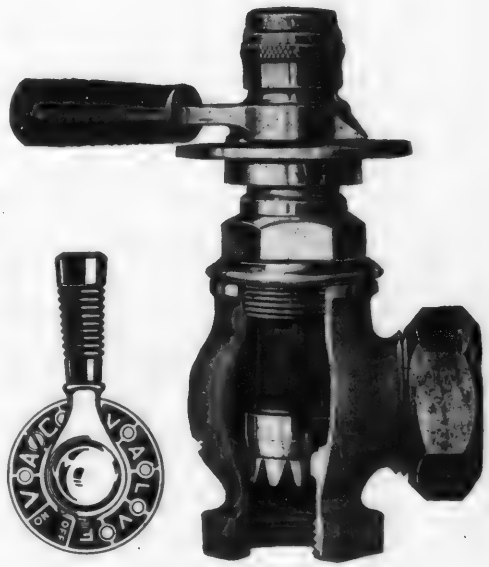
158 Whiting St. CHICAGO, ILL.

Branches in all Large Cities

DETROIT PACKLESS RADIATOR VALVES

The Correct Radiator Valve for Vapor Heating

The Detroit Packless Vacu Valve is a Graduated Valve for Vapor and Vacuum Systems of Heating. The dial plate is provided with a series of holes and a movable pin. This pin acts as a stop for the handle pointer, and is inserted in the hole in the dial nearest the point at which the valve, when opened, admits only sufficient vapor or steam to fully supply the radiator.



DETROIT PACKLESS
Vacu Valve Showing Dial Plate and Lever Handle

Booklet VP-1 Gladly Sent Upon Request

DETROIT LUBRICATOR COMPANY
DETROIT, U. S. A.

LARGEST MANUFACTURERS OF RADIATOR VALVES IN THE WORLD

lack of proper ventilation, an ordinance has been presented to the Chicago council committee on buildings by Alderman Joseph Kostner, designed to put "honeymoon" flats out of business. The committee directed that the Commissioner of Health be instructed to make an investigation and report to the aldermanic body. "The building ordinances provide for proper ventilation in all sleeping apartments," stated Mr. Kostner, in discussing the matter, "but some of the closet beds used in the so-called trick flats cannot be reached under the present ordinance."

Boston, Mass.—Members and guests of the Heating and Piping Contractors' Boston Association took a day off June 25 and held carnival at Nantasket Beach. Dinner at Pemberton Inn at which President Frank A. Merrill was presented with a mysterious package which turned out to be a live pig, was followed by sport events. Fred. Williams won high distinction by capturing the free-for-all long-distance race, three laps of the track. The president's pig, it was announced, will be fattened against the opening dinner of the Fall season.

Charles F. Hauss, one of the early members of the heating engineers' society, who has been stationed for several years in Milan, Italy, representing the American Radiator Company, has returned to New York, where he will be permanently located as vice-president of the Mediterranean Trading Co., Inc., with offices at 29 Broadway. His son, who is with the American army in France, will succeed Mr. Hauss as manager of the Milan office.

Chicago, Ill.—The Chicago Master Steam Fitters' Association held an outing July 1 at "The House that Jack Built," on the outskirts of the city. The party proceeded in some 50 automobiles. A baseball game in the morning, followed in afternoon by sports, made up a very full day. A banquet was served in the evening and the remainder of the evening was taken up with dancing.

George T. Coppins, long a familiar figure at conventions of the heating trade as the representative of the Walworth Manufacturing Co., of Boston, is reported seriously ill at his home in Newton. In a note which he recently dictated regarding the development of the Stillson wrench, Mr. Coppins writes: "In 1870 I was in the employ of J. and H. Jones & Co., N. Y.,

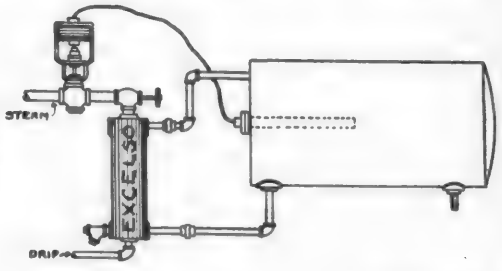
EXCELSO HEATERS FOR STORAGE TANKS

Large Heating Surface
Quick and Efficient

The Heater may be connected in many different ways to storage tanks and may be used with or without thermostatic control. It may also be used with or without the storage tank, either singly or in multiples with or without thermostatic control.

Sizes to fit all conditions

Send for new circular just out



EXCELSO SPECIALTY WORKS, **601 White Bldg.,** **Buffalo, N. Y.**

PIPE BENDING

MARINE EQUIPMENT AND REPAIR WORK
HEATING AND VENTILATING

THE OHIO HEATING AND PIPE BENDING CO.

Main Office and Factory, 1061-63 West 11th Street, Cleveland, Ohio

SOLE AGENTS FOR

F. J. Nice Oil and Combination Oil and Gas Burners

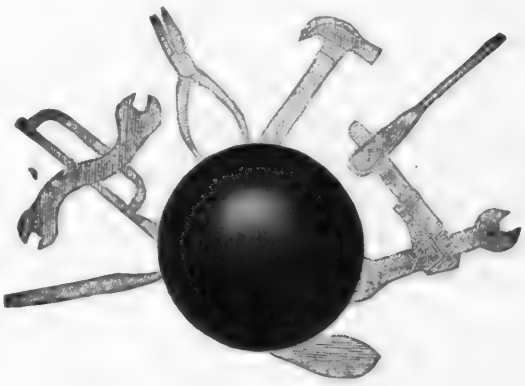
who were dealers in tools. In calling on a concern in Fulton Street, New York, I first saw the genuine Walworth Stillson wrench. It was then thought of no value, but it semed to me to be a good, clean-cut tool. The Brown's Tongs, a noisy, clumsy tool, had the market, and no one thought of such a neat-looking device as the Stillson. I bought some of them from Davis and had very little trouble in disposing of them. The original patent of the wrench had been taken in 1869, I think, and it was near the expiration of the patent that that shrewd mechanic, Mr. Clark Walworth, made an improvement and so extended the patent, making it run until about 1901. The Walworth Mfg. Co. and its skilled mechanics were in a position to fight the world and from that time we held the market. Old Dan Stillson, as he was called, was foreman of our tool shop."

Schoolhouse standardization and planning came in for further discussion by Frank Irving Cooper at the Meeting of the National Education Association in Milwaukee, June 30. Mr. Cooper commented again on the lack of uniformity in ventilation methods for such buildings, the various States being far apart in their legal requirements and still farther apart in the practices permitted. No consideration, he stated, has been paid to the efficiency of the different systems of ventilation. He gave Massachusetts first place in the matter of providing the necessary duct area, the requirements in that State being from 3 to 6% of the total floor area.

Manufacturers' Notes.

Illinois Engineering Co., Chicago, Ill., announces that Frank Van Inwagen, vice-president of the company, is back after a year's service as an officer on the U. S. S. Orizaba. While in the service he visited Copenhagen, Rotterdam and nearly all the French ports. Walter J. Baer has also returned after eleven months' service with the heavy artillery in France and is now representing the Illinois Engineering Company in the Chicago territory.

Wheeler Condenser & Engineering Co., Carteret, N. J., announces the election of J. J. Brown as president of the company, succeeding Charles W. Wheeler, who died recently. Mr. Brown was formerly vice-president of the company. H. S. Brown, formerly associated with the Power Specialty Co., of New York, has been elected vice-president. It is stated that the business of the Wheeler Condenser & Engineering Company has more than quadrupled



None of these tools would be used to adjust a ball

IF your steam fitters had to adjust 875 traps in one building, you would be apt to favor the Johns-Manville Radiator Trap if for no other reason than that it doesn't have to be adjusted.

There's nothing about the Johns-Manville Radiator Trap to adjust. In fact, there's only one moving part, just a ball—that's all, that conbines in itself the function of valve, lever and float. No expanding member is necessary. And it works—reliably.

No adjustments, no come-backs—your profits will show you the advantage of using Johns-Manville Radiator Traps. Our nearest branch or the main office will give you all particulars. Send for them.

H. W. JOHNS-MANVILLE CO.
New York City
10 Factories—Branches in 63 Large Cities

JOHNS-MANVILLE
Radiator Trap

during the past ten years. One important addition has been the construction of a large tube mill for the manufacture of seamless drawn tubing of brass, copper and special mixture. In this mill the record output of nearly 1,000,000 lbs. of condenser tubing in one month was recently made.

John Simmons Co., New York, has commenced operations on the construction of a forge and blacksmith shop at Nelson and Manly Streets, Long Island City. Westinghouse, Church, Kerr Co. are the designing engineers.

New York Blower Co., Chicago, Ill., has moved into the former quarters of the American Three-Way Prism Co., in La Porte, Ind. An additional plant, 100 x 200 ft. will be built shortly adjoining its present factory.

Gurney Heater Mfg. Co., Boston, Mass., tendered a complimentary dinner on June 27 to Alfred G. Merser, secretary and treasurer of the company, in celebration of 26 years of active service. Toasts were drunk to the guest of the evening and to William T. Isaac, vice-president and general manager; George Forrest, the dean of the salesmen, and to Peter W. Sharp, who closely follows Mr. Merser in length of consecutive service with the company. Following the dinner Mr. Merser was presented with a gold watch and chain from his associates Mr. Merser responded, recounting his experiences in the development of the heating industry. He will retire shortly.

Gauld Supply Co., Inc., has taken over the business of the Gauld Co., Portland, Oregon. The directors of the new company are William P. F. Ayer, president; Thomas Nickerson, vice-president; G. A. Ricker, treasurer; Theodore W. Little and Carl T. Keller, all of whom are prominently connected with the Walworth Mfg. Co., of Boston.

Whitlock Coil Pipe Co., Hartford, Conn., announces that L. S. Shaw & Co. of Cleveland, O., will act as its representatives in the Cleveland territory, controlling the sale of heaters and heat exchange apparatus. L. S. Shaw & Company are located at 1836 Euclid Avenue.

James Robertson Mfg. Co., Baltimore, Md., manufacturer of heating and plumbing supplies, has purchased a site on Hopkins Place, near Lombard Street, 40 x 130 ft. for $75,000, on which to build an addition to its plant. The site is near the company's present quarters.

HOW TO SPECIFY

Webster Air Washers

Types "A" and "B"

WITH OR WITHOUT THE

Webster System of Humidity Control

Copy will be mailed on application and your name placed on our mailing list to receive additional bulletins as they are ready.

ATMOSPHERIC CONDITIONING CORPORATION

LAFAYETTE BUILDING

PHILADELPHIA

Please mention THE HEATING AND VENTILATING MAGAZINE *when you write.*

For Your Own Good

Lavigne Packless Quick-Opening Steam Radiator Valves

for the good they can do on your good jobs because of the good principle and workmanship which is built into every valve.

They are BUILT RIGHT—TO STAY TIGHT.
They positively do not leak Water, Steam or Air.
They open quickly and close just as quick.
They are an ornament and a faithful servant to any job.

Made in six sizes, many styles of handle.

All good jobbers have them

COMMONWEALTH BRASS CORPORATION, Detroit, Mich.

TEMPERATURE CONTROLLING APPARATUS

The Basic Principle is RIGHT

Powers Regulators are built with quality-thought first. They are built on a principle which thirty years of use have proved to be basically right.

A Powers Regulator is made for every ordinary condition or process where automatic temperature control is desirable. Adaptations may be made for out-of-the-ordinary conditions without in any way affecting the efficiency of the Regulator.

Our Bulletins give concise, accurate information respecting Powers Regulators. They are free for the asking.

Our more than thirty years' devotion to the problems of temperature regulation exclusively has brought a vast fund of experience, which is at your service.

The Powers Regulator Co. *Specialists in Automatic Heat Control*
95 Nassau St. Bldg., New York. 2143 Mallers Bldg., Chicago
36 The Federal Street Bldg., Boston

Please mention THE HEATING AND VENTILATING MAGAZINE *when you write.*

Richmond Radiator Co., New York, and its affairs are discussed in a recent letter sent to the stockholders of the company by A. C. Penn, chairman of the board of directors. The letter replies to the request of a minority of the stockholders for a change in the management by stating that such a change seemed inadvisable in view of the expected improvement in the building industry. Mr. Penn states that with the exception of radiation, the sales of the company for the first six months of 1919 are in excess of those for the first six months of 1918. The sales of radiation show a decrease of about 20% which, he states, is occasioned by the fact that the company is following the policy of avoiding the sale of radiation at this time, with the exception of taking care of the requirements of its regular customers. "An unusual trade condition has arisen," continues Mr. Penn, "that has resulted in radiation being sold at cost or less. As we do not believe this condition can continue, we think it desirable to continue the manufacture of radiation to the fullest extent of our capacity, with the belief that we will sell all of it at a satisfactory profit during the Fall months.

"X" Laboratories, Boston, Mass., have moved their general offices to New York, where quarters have been established at 25 west 45th Street.

Gurney Heater Mfg. Co., Boston, Mass., held a convention of its sales force recently at its headquarters in Boston. The convention was in charge of William T. Isaac, vice-president and general manager and closed with a dinner at the Parker House.

Buffalo Forge Company's sales force were the guests of H. W. Wendt, Sr., at his summer home at Crescent Beach, Ont., on the occasion of the sales convention of that company, as well as of the Buffalo Steam Pump Company, and the Carrier Air Conditioning Company. An innovation at the meeting was the publication of a daily convention paper known to fame as "The Conoidal Blade," which reflected great credit on its compilers. The session's, which extended from June 25 to 27, inclusive, were replete with business talks, interspersed at frequent intervals with happenings of a lighter nature. Among the speakers were A. A. Criqui, whose subject was "New Designs and Engineering Data"; W. S. Koithan, who discussed contract terms and collections; and Harold English, who spoke on "Fan Engineering on the Pacific Coast. Speakers on air washing

The Mechanical Weather Man says

"If weather,—hot, cold, dry, or moist,—affects your process or your labor turnover, I can install apparatus which will *manufacture* exactly the kind of weather you want,—and maintain automatically any condition of temperature and humidity you specify.

Ask me for Bulletin 100-V. It's full of interesting possibilities for you.

Write me in care of the corporation.

And

Write right now!

Manufacturers of Weather Humidification, Dehumidification, Heating, Cooling Ventilation, Purification, Drying

Carrier Engineering Corporation

39 Cortlandt St., New York, N. Y.

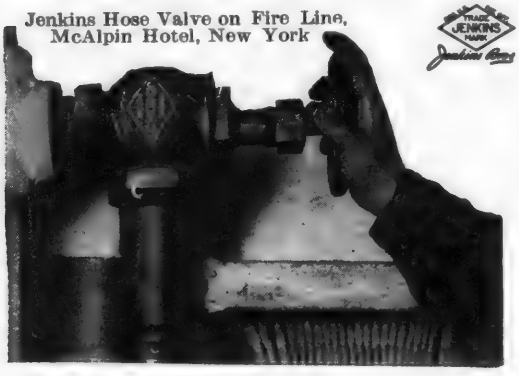
BOSTON BUFFALO PHILADELPHIA CHICAGO

Buffalo Equipped
THE prominent buildings in all parts of the country are equipped with
Buffalo Heating and Ventilating Apparatus
It puts heat, mechanically, just where it is wanted, keeps it in circulation and prevents it from escaping through the ventilators in in the roof until it has been used to the best advantage. Saves coal—increases efficiency of workers.
Catalog No. 198-36 gives valuable engineering data on heating and ventilating problems and our engineering department is always available for consultation.
Buffalo Forge Company
Buffalo, N. Y.
Offices in all Principal Cities
"Buffalo"

BUFFALO FORGE COMPANY'S SALES FORCE AT SUMMER HOME OF PRESIDENT H. W. WENDT.

were R. T. Thornton who gave a talk on "Air Washers and Humidity Control," and W. H. Carrier who described methods of humidity control. "The Conoidal Blade" established a reputation for being a live newspaper. The first number contained, among other things, an account of the growth of the Buffalo Forge Company from the date of its beginning in 1877 when "two men, Mr. Charles F. Bunke and Mr. Charles Mamelman, began to manufacture portable forges. One year later Mr. William F. Wendt, brother of the present 'Big Chief' (Mr. H. W. Wendt) purchased an interest in the business." The account was accompanied by a picture of the company's first factory. Three years later William F. Wendt purchased the interests of his two partners and became the sole owner. Henry W. Wendt, who joined the company shortly after, became a partner in 1888. In 1902 the Geo. L. Squier Co. was purchaser of which H. W. Wendt became the vice-president, secretary and treasurer, and in 1904 the Buffalo Steam Pump Co. was added, in which he holds the same titles. "Today," continues the account, "he is practically the sole owner of a company whose financial rating is Aa-1 and the actual value of which the writer does not know, a company whose employees number about 900 and the products of which are known in every part of the world." An attendance of about 70 representatives was registered, those present including W. S. Koithan and R. W. Pryor, joint managers of the company's New York office; T. A. Weager and P. R. Adrianse, of the Cleveland office; A. T. Coon and H. H. Hughson, of the Coon-De Visser Co., Detroit; H. P. Grant, of the Philadelphia office; H. Coward, of the Washington office; W. P. Nevins, of Minneapolis; C. L. Dean, Denver; C. C. Cheyney and L. L. Emmert, Chicago; B. R. Andrews and C. F. Goodrich, Boston; H.

Jenkins Hose Valve on Fire Line, McAlpin Hotel, New York



Tight Under Pressure

Jenkins Hose Valves are made to hold at all times water pressure up to 250 pounds and at the same time will quickly respond to a turn of the wheel and permit a free full flow.
Globe or Angle types are fitted with Jenkins discs of flexible rubber composition specially made for cold water service which insures absolute tightness under pressure and freedom from corrosion or sticking at the seat. Jenkins Hose Valves are also made in Gate types.
The Jenkins "Diamond Mark" appears on all genuine Jenkins Valves—Look for it—demand it.

JENKINS BROS.

New York Chicago Boston Philadelphia Montreal London

Jenkins Valves

THE UNIT HEATER

was first placed in use in 1870 by B. F. Sturtevant, founder of the B. F. STURTEVANT COMPANY. Since that time, through careful study and engineering pratice, the present day Portable Unit Heater has been perfected. It is just one of the large and growing family of

Sturtevant
(REG. U. S. PAT. OFF.)

Independent Unit Heater

Its relation to the heating of shops and factories is similar to replacement of the old line shafting, by the unit motor drive.

It eliminates expensive, cumbersome overhead piping; it warms just the portion you wish heated; the exhaust steam from the small turbine, driving the disc or propeller fan, heats the steam coils. Its economy is apparent, and its efficiency has been proven.

The following are typical users:

HYDRAULIC PRESSED STEEL CO.
AMERICAN LOCOMOTIVE CO. (5 plants)
BATES MACHINE CO.
CLEVELAND WINDOW GLASS CO.
SCOVILLE MFG. CO.
MERRILL SILK CO.

Our Engineering Staff, with the benefit of this fifty years of experience is at your service. Estimates given without obligation.

B. F. STURTEVANT COMPANY

Hyde Park, Boston, Mass., U. S. A.

AND ALL PRINCIPAL CITIES

Lee Moore, Pittsburgh; H. J. Hinchey, Atlanta, Ga.; H. H. Frownes, St. Louis; Harold English, Los Angeles. J. I. Lyle, treasurer and general manager of the Carrier Engineering Corporation, was also a prominent figure at the convention.

Logansport Radiator Equipment Co., Logansport, Ind., will build a 100 x 270 ft. addition to its plant to be used as a foundry. The estimated cost is $25,000.

Pierce, Butler & Pierce Mfg. Corporation, Syracuse, N. Y., has increased its capital stock from $2,350,000 to $4,000,000. The corporation recently took over the plant and business of the Ames Iron Works, of Oswego, N. Y., manufacturer of boilers, engines, etc.

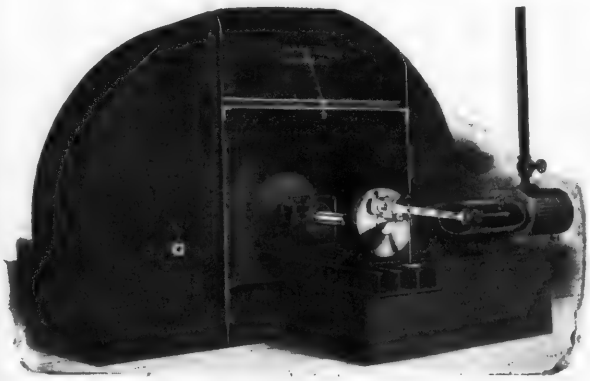
Central Station Heating Notes.

Decatur, Ill.—The first hearing on the petition of the Decatur Railway & Light Company for permission to discontinue the flat rate for steam heating service and adopt the meter rate was set for July 16 before the State Public Utilities Commission. Last Fall when the commission gave the company permission to install meters and adopt meter charges the statement was made that this rate would only be temporary and that after one season had passed under the meter rate there would be a meeting to further consider the proposition, when the charges under the meter rate and the charges under the flat rate could be compared with the idea of getting a proper rate to be charged for the service.

Spokane, Wash.—Motion to disincorporate the Spokane Service Company, a subsidiary concern to the Washington Power Co., has been filed in the Superior Court. It is shown in the motion that the company is free of debt. A hearing was set for September 8. About three years ago the company had a contract to heat the city hall, as well as a number of other downtown buildings.

Watertown, S. D.—An ordinance granting a 20-year franchise to the Watertown Heating Co., regulating the manner in which its system of heating pipes may be installed and maintained, and providing for the optional purchase of the plant by the city at any time at a price that will return to the stockholders the principal invested and 7% interest, was presented to the city council of that city June 16. The proposed ordinance was drafted by D. K. Loucks, at the instance of the local Chamber of Commerce heating plant committee and the incorporators of the company that will

Heating Ventilation
Drying Air Washers
Engines Mechanical Draft



Let us make your plans and estimates

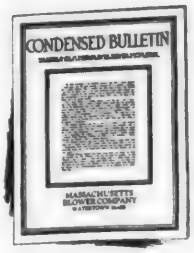
Get Catalogues 65-B and 67-B

OFFICES IN ALL PRINCIPAL CITIES

NEW YORK BLOWER COMPANY

MAIN OFFICE:
513 Transportation Bldg., 608 S. Dearborn St., Chicago, Ill.
Toledo, O.: Room 629 Nicholas Bldg.

WORKS:
Bucyrus, Ohio



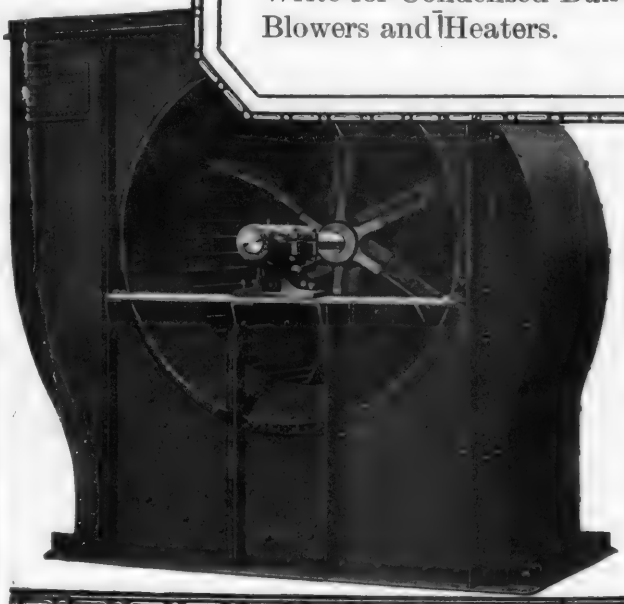
Write for copy—sent for the asking

853,150 Cubic Feet of Air Moved per Minute

By the seventeen Massachusetts Modified Squirrel Cage Fans that make up the ventilating equipment of the Hotel Commodore, New York.

This type of fan, with its saving in space and weight, has been the solution of many a ventilating problem.

Our Engineering Department will be glad to place at your service the statistics and data we have compiled. Write for Condensed Bulletin of Fans, Blowers and Heaters.



MASSACHUSETTS BLOWER COMPANY

WATERTOWN, MASS.

BOSTON CHICAGO NEW YORK
and
Branches in twenty principal cities throughout the country

100-8

operate the system. According to the terms of the optional purchase section of the franchise, the city is to pay the actual cost of the plant, less an amount that the plant may have earned in dividends, adding to this sum only an amount sufficient to make the 7% earning. Mayor Hopkins raised the question of the heating company's connecting with the proposed city light plant and use the exhaust steam from this plant for the heating system. This problem will be left for later consideration.

Bain & Robb, Milwaukee, Wis. have also been awarded the contract for the struction of the vacuum central station steam heating plant at Windom, Minn., at a price of $41,088. This plant is to heat the business district of Windom from the electric light plant. Bain & Robb have also been awarded the contract for the installation of a vacuum central station steam heating plant at Hudson, Wis., for the Burkhardt Milling & Electric Power Co., at a price of $18,665, and an additional contract from the same company for a power house and equipment, to cost approximately $25,000.

New Incorporations.

National Asbestos Co., Jersey City, N. J., capital $1,500,000, to take over the business of the National Air Cell Covering Co., of Jersey City. The incorporators are: A. J. David, Elizabeth Burkhardt and C. W. Burkhardt, Teaneck, N. J.

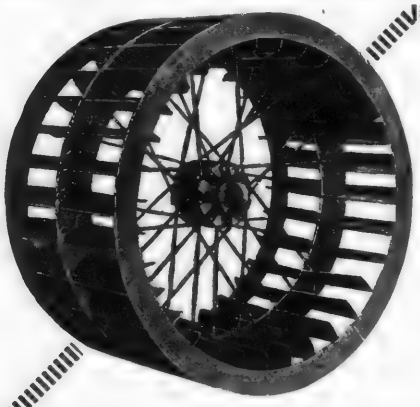
Gould Supply Co., Augusta, Me., capital $225,000, to deal in heating and plumbing supplies. Incorporators: E. M. Leavitt, E. L. McLean, S. L. Fogg, D. A. Leland and M. J. Marston, all of Augusta.

Marion Heating Co., Camden, N. J., capital $125,000, to manufacture heating equipment. Incorporators: David Baird, Jr., F. A. Starr and M. W. Applegate.

American Dehydrating Co., Gary, Ind., capital $1,000,000, to manufacture dehydrating machinery. Incorporators: Horace S. Norton, Ingwald Moe, Chester E. Wirt, William F. Hodges and Oscar T. Gregory.

Rotary Machine & Engineering Co., Lyndhurst, N. J., capital $500,000, to manufacture vacuum pumps, etc. Incorporators: M. J. Noble, Lyndhurst; J. A. Freere, Newark; and J. M. Freere, Wilmington, Del.

Bona Heating System Co., West Hoboken, N. J., capital $250,000, to manufacture heating apparatus. Incorporators: A.

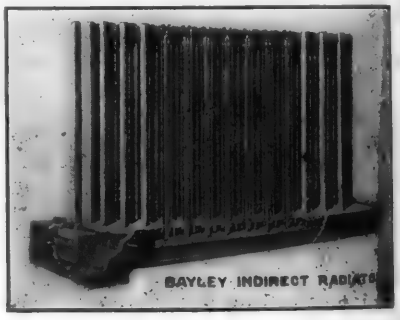


Ask the Bayley Engineers

On request, we will be pleased to submit plans and estimates showing how Bayley Equipment can be supplied to the heating and ventilating of industrial establishments, institutions and public buildings.

BAYLEY PLEXIFORM FANS are strong, light, highly efficient, quiet in operation and deliver maximum quantity of air from minimum of housing. Equally well suited to high and low pressures. Furnished in both double and single widths.

CHINOOK HEATERS provide for rapid and positive circulation of steam with no danger of short circuiting, and no unequal expansion and contraction. Every square foot is prime heating surface.



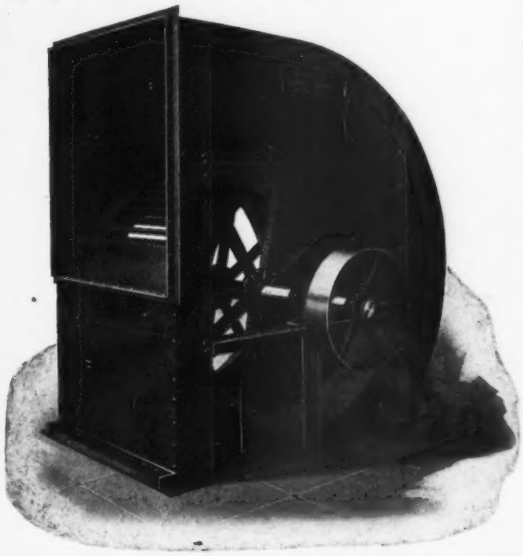
Write for Descriptive Bulletins

BAYLEY MANUFACTURING CO., 732 Greenbush St., Milwaukee, Wis.

Builders of Heating, Ventilating, Drying and Blower Systems

Buckeye Multiblade Fans

are made especially for low pressure Heating and Ventilating work. They are giving perfect satisfaction.



CORRECT DESIGN. HEAVY CONSTRUCTION, NOISELESS OPERATION, WORKMANLIKE FINISH, HIGHEST EFFICIENCY.

Our Engineering Department is maintained for the purpose of assisting Engineers, Architects, etc., in planning efficient Heating and Ventilating Systems for all buildings.

THIS DEPARTMENT IS FREE TO YOU.

We also manufacture a complete line of Disc, Cone and Steel Plate Fans.

Write us

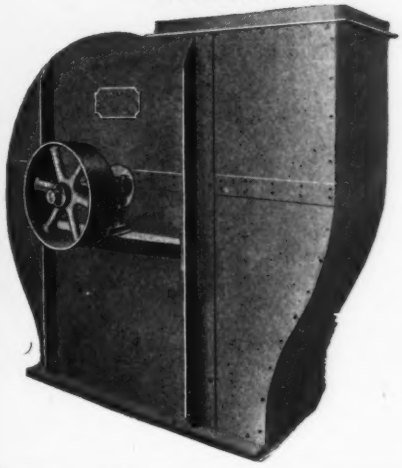
BUCKEYE BLOWER CO.

COLUMBUS, OHIO.

GARDEN CITY CYCLOIDAL MULTIVANE FANS

Cycloidal MULTIVANE FANS TRADE MARK

Efficient and Durable



Perfected after 35 years' experience in manufacture of Fans and Blowers of every description.

Send in your name for our new ***"Multivane Bulletin"*** containing full data on construction and performance of all sizes.

GARDEN CITY FAN CO.

Established 1879

McCormick Bldg. CHICAGO, ILL.

L. J. WING MFG. CO., New York City, Est. Rep's

Andt and Silvio Motta. Registered office, 114 Summit Ave., West Hoboken.

Metallo Gasket Co., New Brunswick, N. J., incorporated to manufacture gaskets and other packings. President and treasurer, Zeno Schultes, formerly manager of the Goetze Gasket & Packing Co.; vice-president, George Geipel; secretary, S. Geipel. The company will specialize in metallo corrugated copper gaskets, with asbestos cord inlaid in the copper grooves or corrugations.

Business Chances.

Bicalky Fan Company Changes Hands.

Announcement is made that the Bicalky Fan Company of Buffalo, N. Y., has sold its business to Hersh & Brother, of Allentown, Pa. The Bicalky products include Bicalky fans, air washers, dust collectors, dust arresters and roof ventilators.

The purchasers of this manufacturing business are well-known in the heating and ventilating field. For many years they have operated a large manufacturing plant in Allentown, Pa., where the Bicalky products are now being made. Branches have also been opened in Philadelphia and Buffalo.

New Firms and Business Changes.

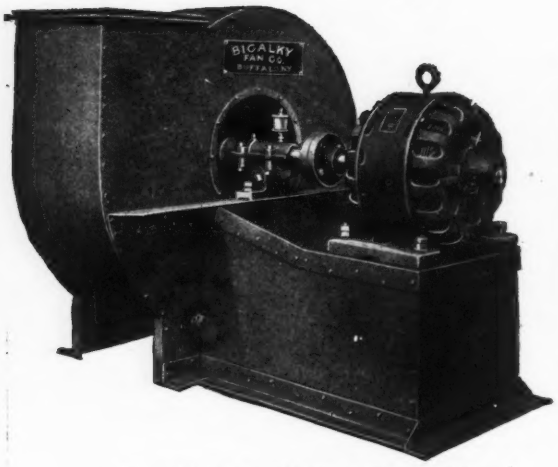
Mayer & Valentine, composed of R. J. Mayer and F. H. Valentine, of Cleveland, O., have formed a partnership as heating, ventilating and power plant engineers and have opened an office at 615 Bangor Building, Cleveland.

Bill to Prohibit Use of "Cost-Plus" Contract on Government Work.

A bill recently introduced in the Senate by Senator Poindexter of Washington is designed (1) to prohibit the use of the "cost-plus" form of contract on government work, and (2) the payment of commissions for the awarding of government contracts.

Opposition to the first section of this bill has been expressed by the Associated General Contractors of America. "No doubt during the war, it is stated, on account of unusual conditions, this form of contract had to be used in cases where another form would have been far more economical and satisfactory. However, the very fact that only by the use of this form of contract could the results de-

BI-CAL-KY



BI-CAL-KY FANS ARE GOOD

WE wish to announce to the former customers of the Bicalky Fan Company of Buffalo, N. Y., and to the trade in general, that we have purchased the business of the Bicalky Fan Company.

It is our intention to continue the manufacture of this product in the careful manner of our predecessors and to render at all times engineering data to assist our customers in the sale and in the installation of Bicalky Fans, Air Washers, Dust Collectors, Dust Arresters, and Roof Ventilators.

On our staff of engineers, we have retained Mr. C. H. Bicalky, who will also take care of our interests in Buffalo.

We solicit your inquiries and assure you of our co-operation.

HERSH & BROTHER

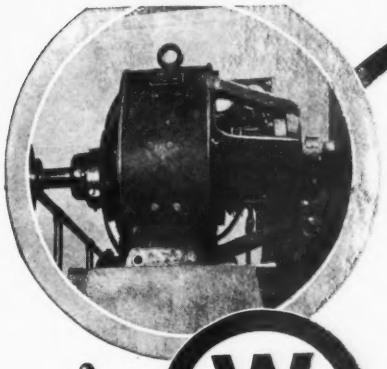
Main Office and Factory
Allentown, Pa.

951 Niagara St.
Buffalo, N. Y.

Perry Bldg.
Philadelphia, Pa.

Westinghouse

Electrical Equipment For Ventilating Service



In 1912, eight Westinghouse Type SK direct current motors were installed in the Ritz Carlton Hotel to drive the blowers ventilating the kitchen.

No New Brushes IN Seven Years

Although these motors have been in operation from early morning till late at night, every day during the last seven years, the original brushes are still in use.

This Means Perfect Commutation—Proved by Long Life of Brushes.

These motors have required practically no attention since their installation.

Westinghouse Electric & Manufacturing Company
East Pittsburgh, Pa.

W
WESTINGHOUSE ELECTRIC

Ritz-Carlton Hotel
New York City: Warren & Wetmore, Architects; Clark, Mac-Millen & Riley, Consulting Engineers.

sired be obtained at all, establishes the weakness in the proposal made in the first section of the bill. In many cases of emergency and under various other circumstances, the interest of the government is far better served by the use of the cost-plus form of contract than by any other form."

The bill was referred to the Committee on Judiciary of the Senate.

New Ruling on Bond Premiums on Government Contracts.

A recent ruling made by the Comptroller of the Treasury is to the effect that the form of "cost-plus" contract in use by the Construction Division does not authorize the reimbursements to contractors of the cost of premiums on their bonds. This ruling has been adhered to in the face of strong objections by the chiefs of the Construction Division. If this ruling is sustained, it is quite certain that all contractors having unsettled contracts for work under that division and money due them under such contracts will now have deducted from any balance due them the sum of all payments heretofore made to them, covering reimbursement of premium on bonds. This will probably include not only their unsettled contracts but such payments made upon other contracts of this class upon which settlements have already been made.

It is probable that the matter will be carried to the Court of Claims. In the meantime, contractors are advised by the Associated General Contractors of America to decline to refund any payments of the kind noted.

FOR SALE

One No. 8 Double-Width

Multivane Blower

NIAGARA CONOIDAL TYPE
Manufactured by the Buffalo Forge Co.

Has been used about one year. In perfect condition bearings in first-class order.

Price $500.00
F. O. B. Dunedin

SKINNER MACHINERY CO.
Dunedin, Florida

RIC-WIL Paint for Heated Surfaces

A brilliant black paint of superior preservative properties, dries hard yet is tough and elastic. It has a bond with clean metal that preserves its adhesion during contraction, expansion and bending.

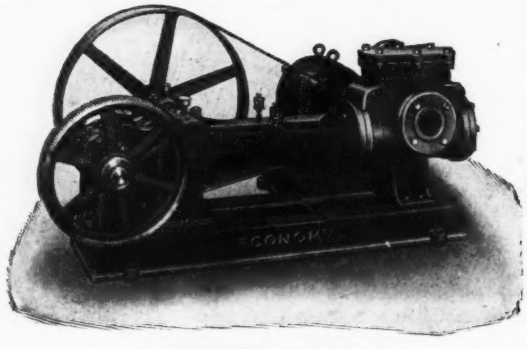
Lasts Much Longer than the Average Coating.
Especially Good for Underground Heating Pipes.
Let us send You a Free Sample to Test.

THE RIC-WIL COMPANY, Cleveland, O.

GOLD'S THERMOSTATIC HEAT REGULATING SYSTEM

Operated entirely by ELECTRICITY.
Each room is a unit by itself.
Does not depend on an air compressor.
Requires no attention whatever.
Is free from all troubles which usually affect such devices.

GOLD CAR HEATING AND LIGHTING CO.
17 Battery Pl. (Whitehall Bldg.) New York



This Outfit is Noiseless

Economy Return Line Vacuum Pumps

Electric or Power Driven High Class Bronze Fitted

PRICE CAN'T BE BEAT

Quantity production in specialized lines enables us to make prices that others making a large variety of apparatus cannot meet.

Keep in Step with the Times Be a Specialist

Buy your Return or Air Line Vacuum Pumps, Condensation or Hot Water Circulating Pumps from Manufacturers who specialize in pumps for the Heating Trade.

Don't fail to write for "ECONOMY MANUAL "B." Most complete vest pocket Heating, Ventilating Engineer's Hand Book. This publication mailed free on request.

ECONOMY PUMPING MACHINERY CO.
120-128 N. Curtis St., Chicago, Ill.